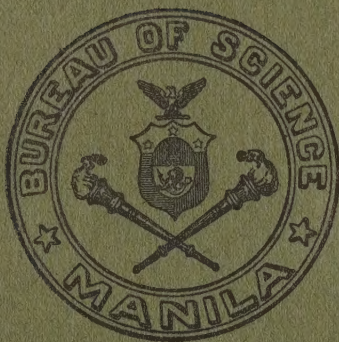


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No. 1

RICE AS A SUBSTITUTE CEREAL IN THE MANUFACTURE OF SOY SAUCE

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and

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Soy sauce is a salty liquid of dark-brown color made by fermentation of soy beans and a starchy component.

Recently we carried out experiments on the manufacture of soy sauce and found that rice could be used successfully as the starchy material necessary for making the sauce.

Soy sauce is widely used as a condiment in Japan, China, Java, the Philippines, and other countries. It is the base of the well-known Worcestershire sauce.

The Chinese method of soy-sauce manufacture¹ is used in the Philippines. The beans are soaked in water, cooked, drained, and mixed with flour. The mixture is spread on trays and left exposed for the spontaneous growth of molds. *Aspergillus niger* and *Aspergillus oryzae* usually grow together in this mixture. After the molds have grown for about a week, the whole mass is placed in 25 per cent salt solution contained in earthen jars and exposed to the sun for 2 to 3 months. The first drawings are made after this period.

The Japanese use roasted barley or roasted whole wheat instead of flour in making soy sauce.

¹ Groff, E. H., *Philip. Journ. Sci.* 15 (1919) 307.

EXPERIMENTAL PROCEDURE

In our experiments we followed the Japanese method² for making soy sauce. Rice being the most abundant cereal in the Philippines, it was tried in place of wheat or barley. The beans (100 parts by weight) were soaked in running water for 24 hours. Continuous change of water is essential to prevent souring of the liquid and the fermentation of the material due to bacteria which are on the beans in the form of spores. The soy beans were cooked in an autoclave until they could be easily crushed between the fingers. They were then drained and allowed to cool. The rice (70 parts by weight) was roasted to a brown color, reduced to a coarse powder, allowed to cool, and inoculated with spores of *Aspergillus oryzae*. The inoculated rice powder was mixed with the beans so that every bean was coated with it. The mixture was placed in shallow trays and piled about 3 centimeters deep. At the end of about 18 hours it was stirred to break up the beans that were bound together by the mycelia of the mold. Heat is generated during the fermentation, and thorough stirring is necessary to aerate and cool the mixture. Since the presence of moisture and the lack of oxygen favor the development of mucors and bacteria which are detrimental to the flavor of the sauce, excessive heat should be avoided because this condition increases moisture condensation.

The mass was left undisturbed for a period of 7 hours, then stirred a second time. Again the mixture was incubated for 12 to 14 hours, after which it became coated with the yellow spores of the mold. It was allowed to mature for another 24 to 30 hours. At the end of this period the mass, which could be lifted as an entire block, was disintegrated and transferred into brine (95 parts salt by weight in 180 parts water by volume).

For every 4 liters of the resulting mixture, 10 grams of yeast was added and allowed to ferment for 3 months with occasional stirring. The sauce was extracted by pressing the mass and filtering the liquid.

RESULTS

After a fermentation period of one month the sauce was found to contain 5.3 per cent protein by analysis. At the end of 3 months the protein was 7.5 per cent.

² Church, Margaret B. U. S. Dept. of Agriculture. Dept. Bull. No. 1152 (1923) 1.

The sauce obtained was a very dark-brown clear liquid. Its taste and flavor was similar to that of the best quality of Japanese soy sauce.

The Pure Food and Drugs Act requires a minimum of 4.5 per cent protein for this kind of sauce. One month of fermentation is sufficient to give a product that meets this specification. A new brine may be added to the residue and allowed to ferment for about 2 months to get a second sauce.

SUMMARY

Rice was found to be a good substitute for wheat flour or barley in the manufacture of soy sauce.

Sauce obtained after a month of fermentation contained 5.3 per cent protein, and that after 3 months, 7.5 per cent. These results meet the requirements of the Pure Food and Drugs Act.

The quality of soy sauce prepared by this method compares favorably with the best brands of Japanese soy sauce.

NOTES ON NATURAL DYES FROM IPIL, NARRA, AND TAÑGILE SAWDUST

By F. AGCAOILI, M. ALDE, and R. J. COCHICO

Of the Bureau of Science, Manila

Sawdust, found in abundance in lumber mills, is generally used for packing. To find other uses for this byproduct, studies have been conducted on the extraction of its coloring matter for use in the dyeing of cotton, for which synthetic dyes imported from abroad are usually used. The sawdust of ipil (*Intsia bijuga*), tañgile (*Shorea polysperma*), and narra (*Pterocarpus indicus* Willd.) has been included in this investigation. The results are given in this paper.

METHODS OF EXTRACTION

Various methods of extracting the coloring matter from the sawdust of these woods have been tried; among these the following three were selected as the simplest. The coloring matter obtained includes resins and tannic acid.

Method 1.—The sawdust is extracted by boiling under ordinary pressure with a 1 per cent acetic-acid solution for 3 to 4 hours. The decoction is filtered and evaporated to dryness. The extract is ground into a powder.

Method 2.—The sawdust is extracted by boiling with a 1 per cent sodium hydroxide solution under ordinary pressure for 3 to 4 hours. The decoction is filtered and evaporated to dryness. The extract obtained is ground into a powder.

Method 3.—The sawdust is boiled in ordinary water for 5 hours at ordinary pressure. The decoction is then filtered and evaporated to dryness. The extract is ground into a powder form. This method of extraction is the simplest.

All three methods were applied to ipil, narra, and tañgile sawdust. Method 3 was found the most applicable, and hence was adopted in this work. Tañgile sawdust, however, when very dry and old, is better extracted by the use of method 2. From 7 to 12 per cent solid extract, based on the air-dried sawdust, is obtained with these methods.

PROPERTIES OF THE EXTRACT

Ipil sawdust extract.—Ipil sawdust extract is dark brown in the powdered form and reddish-brown in water solution. The addition of hydrochloric acid renders it yellowish brown, and sulphuric acid gelatinous light brown. In an alkaline solution it becomes dark brown.

Narra sawdust extract.—The narra sawdust extract is blackish brown in powdered form and dark yellowish brown in water solution. With hydrochloric acid the color produced is light yellowish brown, and with sulphuric acid it is somewhat darker. The addition of 10 per cent sodium hydroxide solution to its water solution gives it a bluish-green fluorescence.

Taṅgile sawdust extract.—In powdered form the taṅgile sawdust extract is brown, and in a water solution it is light brown. The addition of hydrochloric or sulphuric acid to the water solution renders it yellowish brown, and the addition of sodium hydroxide, dark brown.

PRELIMINARY TREATMENT OF COTTON

Raw cotton goods contain waxes, serecins, oils, and other impurities, which must be removed before the cotton goods are dyed, if good penetration and level dyeing is to be obtained.

The cotton is scoured or boiled in a bath containing 10 per cent sodium carbonate (2 per cent sodium hydroxide can be used also) on the weight of the material. The goods are worked in this bath for 2 hours or left overnight in the above solution after thorough wetting with water. It is then rinsed well with water and hydroextracted.

METHODS OF DYEING

Different methods of dyeing cotton with the extracts obtained were tried. All of them produced good results, varying only with regard to fastness. The following methods are those that yielded favorable fastness properties.

METHOD 1

*Mordanting.*¹—Before being dyed, the scoured cotton is mordanted as follows: The cotton is gradually heated in a bath containing 4 per cent potash alum and 1 per cent sodium

¹Furry, Margaret S., and Bess M. Viemont, *Home Dyeing with Natural Dyes*. U. S. Dept. Agr. Misc. Publ. No. 230 (1935).

carbonate (on the weight of the material) and boiled for 1 hour. Then it is cooled and allowed to stand in the bath overnight.

Dyeing.—The mordanted cotton is immersed in a dye bath containing 10 per cent of the sawdust extract (1:20 liquor) and worked for 1 hour at the boiling point. Then 40 per cent sodium chloride (Glauber's salt can be used instead if desired) are gradually added to exhaust the bath, and the material is soaped, rinsed, and hydroextracted.

After treatment.—To improve fastness, the dyed material should be after-treated. Two after treatments were used in this experiment.

(a) *After treatment with copper sulphate.*—A warm bath containing 1 per cent copper sulphate is prepared, and the dyed cotton immersed in it and allowed to stand till the bath cools. Then it is rinsed and hydroextracted.

(b) *Potassium-dichromate after treatment.*—The dyed cotton is immersed in a warm bath containing 2 per cent potassium dichromate and 1 per cent acetic acid, and worked in the bath till cool. Then it is soaped, rinsed, and hydroextracted.

This method gives a very good fastness to cotton dyed with ipil sawdust extract.

METHOD 2

Mordanting.—Same as in method 1.

Dyeing.—The mordanted goods are placed in a dye bath containing 10 per cent of the sawdust extract, 0.5 per cent potassium dichromate, and 0.1 per cent acetic acid, worked for 1 hour in the bath, and 40 per cent of sodium chloride gradually added to exhaust the bath. Then the material is soaped, rinsed, and hydroextracted.

After treatment.—The dyed material is placed in a warm bath containing 2 per cent copper sulphate and allowed to cool. Then it is soaped, rinsed, and hydroextracted.

Narra-sawdust extract gives a fair fastness to cotton by this method of dyeing.

METHOD 3

Mordanting.—The scoured yarn is placed in a bath containing 1 per cent ferric chloride on the weight of the material for 1 hour at the boiling point. A 1:20 liquor is used.

Dyeing.—The treated yarn is dyed in a dye bath containing 10 per cent of the sawdust extract (more is required for tañgile sawdust extract) and worked for about 1 hour at the boiling point. Then it is soaped, rinsed, and hydroextracted.

After treatment.—The after treatment of the dyed cotton with 1 per cent potassium dichromate is especially adapted to the dyeing of cotton with tañgile-sawdust extract.

The colors obtained from the above methods were different shades of brown. The ipil-sawdust extract gave dark-brown colors, the narra-sawdust extract yellowish-brown or khaki shades, and the tañgile-sawdust extract, light shades of brown, and grayish brown with method 3.

FASTNESS PROPERTIES

The fastness properties of cotton dyed with the extract of ipil, narra, and tañgile sawdust have been tested and found to be fair. The colors will last as long as the material.

Table 1 shows the fastness properties of the dyed cotton. The fastness is graded by the following numbers: 1—excellent, 2—very good, 3—good, 4—moderate, 5—poor.

TABLE 1.—Fastness properties of cotton dyed with sawdust extracts.

Manner of dyeing.	Rubbing.	Hot ironing	Light.	Acetic acid.	Lime water.	Soda boil.	Washing.	Concentrated ammonium hydroxide.	10 per cent sodium carbonate.
Method 1:									
No. 1 ipil ^a	1	1	3	1	2	4	2	2	2
No. 2 ipil ^b	1	1	2	1	2	2	2	2	2
No. 3 ipil ^c	1	1	2	1	2	4	2	2	2
No. 1 narra ^a	1	1	4	2	3	5	5	3	2
No. 2 narra ^b	1	1	2	2	2	5	5	2	2
No. 3 narra ^c	1	1	3	2	3	5	4	3	2
No. 1 tañgile ^a	1	1	3	2	2	2	2	3	2
No. 2 tañgile ^b	1	1	2	2	3	4	3	3	3
No. 3 tañgile ^c	1	1	4	1	2	4	3	2	2
Method 2:									
Ipil.....	1	1	2	1	3	2	3	2	2
Narra.....	1	1	2	1	2	3	2	1	3
Tañgile.....	1	1	2	2	2	2	2	1	3
Method 3:									
Tañgile.....	1	1	2	1	3	3	2	1	3

^a Not after-treated.

^b After-treated with copper sulphate.

^c After-treated with potassium dichromate.

From Table 1 it appears that cotton goods may be satisfactorily dyed with extracts obtained from ipil, narra, and tañgile sawdust by the above-described methods.

THE ILOKO SUBSTANTIVAL VOICE

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The difficulty alluded to in connection with the possessives occurs here also in the composition of sentences in which the object is a personal pronoun of the second series, and in which the verb has a possessive (the subject) joined to it. The similarity or rather the absolute equality of both constructions is a practical illustration of what has been said about the construction of sentences in the substantival voice.¹ Examples:

<i>surótenka</i>	I follow you.
<i>surótem</i>	follow him.
<i>surótennatayo</i>	he follows us.
<i>sinúrotdakayo</i>	we followed you.
<i>sinúrotyo idé</i>	you followed them.
<i>surótendaka</i>	they follow you.
<i>diak suróten</i>	I do not follow him.
<i>dínak suróten</i>	do not follow me.
<i>saánnakam a suróten</i>	he does not follow us.
<i>dínakay suróten</i>	he does not follow you.
<i>saánmi idé a sinúrot</i>	we did not follow them.
<i>saánta a sinúrot idé</i>	we did not follow them.
<i>dídak suróten</i>	do not follow me.
<i>saándaka a sinúrot</i>	they did not follow you.
<i>saánda idé a sinúrot</i>	they did not follow them.

1. THE SUFFIX *EN*

A. THE SIMPLE SUFFIX

I. Form of the present: the suffix *en*; Form of the past: the infix *in*.

II. This is the most used of all prefixes, infixes, and suffixes of verbs in the substantival construction, and verbal stems that do not allow it are rather scarce. It is really the

¹ We refer the reader to the tables given under Possessives, *Anthropos* 28 (1933) 692-694, as the combinations and the metamorphoses of the possessives are exactly the same in both constructions.

one almost universal suffix for transitive verbs in the Iloko substantival voice. Examples:

<i>saganám ti kanék</i>	prepare my food.
<i>tuládendak</i>	imitate me.
<i>ginátanġko ti áso</i>	I bought the dog.
<i>isú ti inálami</i>	that is what we took.
<i>bináutmo dagiti ubbiġ</i>	did you whip the children?
<i>siká ti inarákupna</i>	it was you he embraced.
<i>sapúlem ti napúkawmo</i>	look for what you lost.
<i>patiényo ti saók</i>	believe my words.
<i>tinuġpálda ti bilinko</i>	they obeyed my order.
<i>dawátenda ti libro</i>	they ask for the book.
<i>lutoénmi ti tinápáy</i>	we bake the bread.
<i>pinígisna ti papél</i>	he tore up the paper.
<i>pidútem ti natinnág</i>	pick up what fell down.
<i>daytáy ti basdek</i>	this is what I read.
<i>aniá ti uráyenda</i>	for what do they wait?
<i>siká ti kitáen dagiti saġġalli</i>	it is you at whom the foreigners look.
<i>tulúyenyó ti saríta</i>	continue the story.
<i>diak inarámid ti inbagám</i>	I did not do what you said.
<i>aġġáyendakami</i>	they invite us.
<i>tinákawda ti kaldíġ</i>	they stole the goat.

B. This suffix is used especially:

1. To form verbs meaning: to consider, use, and the like, something for what the stem implies. Examples:

<i>imbagényo ti dákes</i>	you consider the bad as good.
<i>pintásenda ti naalás</i>	they consider the ugly as beautiful.
<i>takrótenmi ti ásoyo</i>	we consider your dog as timid.
<i>bassitém daytáy</i>	do you consider this as little?
<i>línatíġko ní gayyémko</i>	I considered my friend as clever.
<i>síġġpeténda dagiti ubbiġ</i>	they consider the children as virtuous.
<i>siák ti tináyagda</i>	me they considered as tall.
<i>asín ti apoém</i>	who is your master? (literally: whom have you as master?)
<i>ininaonámi ní Ana</i>	Ann was our elder sister.
<i>inardiéndak</i>	I am their younger brother.
<i>dínak adipnéen</i>	do not use me as a servant.
<i>dayáen ti baláy ní áma</i>	it is at the east of my father's house (literally: my father's house has it at its east side).
<i>amianánen ti lamisáanko</i>	it is at the north of my table.

NOTE 1. A strange construction occurs here: a kind of comparative formed with the verb in *en*, the stem of which is an adjective; the object

is compared with another term with which it is connected by the conjunction *ngem*. Examples:

<i>adayoénmi ti baláymi ngem ti tá-lonyo</i>	we consider our house as farther than your rice field.
<i>lináwada ti agámanḡda ngem ti baláymi</i>	they thought their granary larger than our house.
<i>sayaátenda ti kabáyom ngem ti kabáyok</i>	they consider your horse as better than mine.

2. To form verbs meaning: to make, to obtain, and the like, something implied by the stem, from a certain material, for instance. Examples:

<i>badoém toy lúpot</i>	make a coat out of this cloth.
<i>sinapinda</i>	they made trousers out of it.
<i>pandiliḡḡenda ti inabélða</i>	they make a <i>saya</i> out of what they wove.
<i>kawárenyo toy landók</i>	work this iron into a chain.
<i>bunehḡḡenda kanó</i>	they say they will work it into a cutlass.
<i>manó ti pagáyem itt tálonmo</i>	how much rice do you get from your rice field?
<i>bagasénminto daytá písos</i>	we shall give rice for that peso.
<i>piniḡḡólna ti boókna</i>	she did up her hair in a chignon.

3. With the cardinal numbers of tens, hundreds, and so on, and the names of coins, and the like, to form verbs meaning: to complete a number, a sum, for example, that lacks some units, or the like. Examples:

<i>saḡḡapuloém dagiti waló a sipiḡḡ</i>	increase the eight centavos to ten.
<i>duá puloém ti saḡḡapulo ket talló ḡḡa inálam</i>	increase to twenty the thirteen you took.
<i>pisósenmi</i>	we make it a peso.
<i>salapiéndá pay ti duá a peséta</i>	let them increase first the forty centavos to fifty.

4. With the names of the parts of the body, to form verbs meaning: to use a member of the body for a certain work; in this case, the first open syllable of the stem together with the next consonant if there is any, has to be reduplicated. Examples:

<i>ramramáyenda ti agpidut</i>	they pick it up with their fingers.
<i>im-imáenmi ti agkáti</i>	we dig with our hands.
<i>matmataéntayo ti agsúkat</i>	let us measure it by sight.
<i>saksakáenyo daytá</i>	do it with your feet.

B. COMBINATIONS

I. All these combinations form their past in the same way as the simple suffix *en*, by changing the suffix *en* into the infix *in*.

II. The following are the most noteworthy combinations:

1. With the prefix *tagi*, indicating property or possession; consequently the combination generally means: to consider something as having a certain quality. Examples:

tagipatgéndá ti saók
tagibassiténdá
tagialasénmi ti agkastá

tagidaksénmi daytá
tagikawesénna ti gárit
tagikawesénmi dagitá táo

tinagisayáatko daytá baláy
tagidagsenénmi ti agyán ditóy
tagibantótenyo daytóy a káyo
tinagináyonmo
tagilakoénda ti bunéng

they prize my words.
they consider it as small.
we consider acting that way as unbecoming.
we consider that as bad.
she likes striped cloth for a dress.
we esteem those men very much (as much as our clothes).
I considered that house as nice.
we think it hard to stay here.
you consider this wood as heavy.
you used it a long time.
they sell cutlasses.

2. With the prefix *kara*, indicating repeated action. Examples:

karakuddoténna
karapidútenna ti bató
karakugtárenda ti ásomí
karapugsáttenyo ti gálut

he nips me continually.
he picks up stones continually.
they kick our dog continually.
you snap the band continually.

3. With the prefix *sag* of distributives. Examples:

sinagduduána idá nga inbáon
sinagpipitó
sinagsaṅṅkaraṅṅkáy
sagpamitlóem idá
sagpaminpaténdatayo a pakanén
sagliliṁaénda idá a baúten

he sent them two by two.
seven by seven.
piece by piece (of meat).
(give) them each three times.
they feed us each four times.
they whip them five by five.

NOTE 2. Some other combinations and forms. Examples:

saṅṅkanaígem daytá lípot

kaiddaénna
pakinakména daytá
saṅṅailiénda ti kaaróbami
lippiitem

cut this cloth into pieces (of a certain width).
lie down with me.
he thinks that.
they have our neighbors as guests.
clap it.

2. THE SUFFIX *AN*

I. Form of the present: the suffix *an*; Form of the past: the infix *in* and the suffix *an*.

II. A. This is also a much used suffix of the substantival voice, and it generally indicates that something is put, made, or placed, in something, or taken off, or out, from something; this suffix really implies the notion of the locative or ablative. For example, *sagádenna ti tápok* means: he sweeps the dust (a simple action); *sagádanna ti silíd* means; he sweeps the room (an action in the room); *sursuroém*: learn it; *sursuroám*: teach him; *takáwek*: I steal it; *takáwak*: I rob him; *siníkapko*: I considered him as astute; *siníkapak*: I fooled him.

We have seen some practical uses of this suffix in connection with substantives² and in connection with substantives with verbal notions,³ where the truth of the above statement has been amply proved. But to further illustrate it we shall give below some of the most common uses of this verbal suffix *an*. However, the universally correct discrimination between the suffixes *en* and *an* has to be learned by use. Examples:

<i>puóranna ti káyo</i>	he burns the wood.
<i>abánganda ti baláy</i>	they rent a house.
<i>sukatám ti bádom</i>	change your coat.
<i>inayabánmi idá</i>	we called them.
<i>ramanántayo</i>	let us taste it.
<i>anúsam ti kadawiánna</i>	bear with his customs.
<i>isú ti kalikagúmanyó</i>	that is what you desire.
<i>díka tarigagáyan ti asáwa ti pádam</i>	do not covet your neighbor's wife.
<i>a táo</i>	
<i>díka agúman ti saánmo a kúkua</i>	do not covet your neighbor's goods.
<i>nirañggásanda</i>	they injured it.
<i>bay-ám daytá</i>	leave that.
<i>tawáram daytá manók</i>	bargain for that chicken.
<i>bantáyanyo dagiti annákya</i>	watch your children.
<i>indeñgányo ti balákadna</i>	heed his advice.
<i>sambútam ti nadadáelmo</i>	make good for what you spoiled.
<i>bayádanna ti útañgna</i>	he pays his debts.
<i>balíwam ta dákes</i>	do it again as it is bad.

B. The suffix *an* forms verbs meaning:

1. To place what the stem implies into, on, over, and so forth, something. Examples:

<i>kalubám ti bángá</i>	cover the pot.
<i>asinánda ti kárne</i>	they salt the meat.
<i>dinanumánmi ti árak</i>	we added water to the wine.
<i>lanánda dagiti sapátos</i>	they oil the shoes.
<i>dapoánnyo ti rugít</i>	strew ashes over the dirt.
<i>sinupótanna ti púñgan</i>	he covered the pillow with a pillow-case.

² *Anthropos* 26 (1931) 472, 474.

³ *Iloko adjectival voice. Philip. Journ. Sci.* 69 (1939) 223.

atapántayo ti lamisáan
ti anákna ti kinawesák
gatásam ti kapi
lansám dagiti ladáwan
tinakupánda ti bádoda
tapiám ti bito
dikam apúgan ti gawéd no agma-
mákami
pagáyanda ti tálonda
tayúmanminto
kapásanyo daytá bañgkágyo
balatónġanda
siloám ti billit
appanám
rikpám ti roánġan

let us wedge the table.
 his child was the one I clothed.
 add milk to the coffee.
 nail the pictures.
 they patched their coat.
 put a stone over the pit.
 we do not sprinkle lime over the
 betel when we chew.
 they sow rice in their rice field.
 we shall sow indigo in it.
 sow cotton in that field of yours.
 they sow green gram in it.
 ensnare the bird.
 bait it.
 close the door.

2. To do something in, on, or at a certain place, for, in behalf of, and so on, somebody. Examples:

raepám ti tálonmo
kuskúsam ti lamisáan
saplídam dagiti alikámen
asín ti apálan dagitá
awán ti tinakáwak
kararáganmi ti katalékmi
dawátakto ti gayyémko
lukatám ni ina
sinaksiánmi ti lakáy
kiddayám dagitóy
layátanda ti áso
pinayapáyandak
patítam no dumatéġ

transplant rice in your rice field.
 scrape the table.
 dust the furniture.
 whom do these envy?
 I robbed nobody.
 we pray to our advocate.
 I shall ask my friend.
 open for my mother.
 we testified for the old man.
 wink at these.
 they threaten the dog.
 they beckoned me.
 ring the bells for him when he ar-
 rives.
 water the plants.
 wet those.
 we besprinkle them.
 help your neighbor.
 I anointed the dying.
 he made his friend promise.

eibugám dagiti mûla
uprám dagitá
warisanmi idá
tulónġam ti kaaróbam
pinuloták ti agbugsót
kinariánna ti gayyémna

3. To augment, to diminish or the like, something. Examples:

pinutólанда ti tulisán
silpoányo ti adigi
nayónanyo pay
degdegánna ti gúrana
kartibam ti lúpot
kissayám ti danúmna
linukásanda
lukatám ti táwa
pukísam
kayásanda ti kawáyan

they beheaded the robber.
 joint another piece to the post.
 you still augment it.
 it inflames his hate.
 cut off a part of the cloth.
 diminish its water.
 they uncovered it.
 open the window.
 cut his hair.
 they strip bamboo.

4. To earn something by what the stem implies. Examples:

tinalónak ti duá a burnáy

I earned two jars by working the rice fields.

salapí ti dinattanna

she earned fifty centavos by sewing.

manó ti tinibbiányo

how much did you earn by spinning?

diniñgoánmi ti maysá a baláy

we earned a house by raising animals.

5. To pay or offer a number of pesos and so on, for something. Examples:

manoánda ti bagásko

how much do they offer for my rice?

pinitoánmi a salapí

we paid fifty centavos.

minanoányo ti kabáyona

how much did you pay for his horse?

tinallóanna a pisos

he paid three pesos.

limaántayo

let us offer five for it.

pisósanda

they offer a peso for it.

NOTE 3. The suffix *an* is sometimes combined with the infix *an*. Example:

banetbetánná daytá

he strikes that one with force.

3. THE PREFIX *I*

A. THE SIMPLE PREFIX

I. Form of the present: the prefix *i*; form of the past: the prefix *in*.⁴

II. A. This prefix is used extensively in substantival constructions, and because it nearly always remains, whatever prefix or suffix is joined to its stem, and has besides an extreme versatility of meaning, this prefix has a kind of ubiquitous character and is perhaps the most common of all prefixes, infixes, and suffixes used in Iloko.

The prefix *i* generally indicates that something is used to perform the action implied by the stem; it is a real instrumental prefix. For example: *gatánġenna ti áso* means: he buys the dog; *igátanġna ti salapí* means: he pays half a peso (literally: he buys with half a peso); *rikpám*: close it (the opening); *iriképmo*: close with it (with the frame of boards); *lukatám*: open it (the opening); *ilukatmo*: open with it (with the frame); *surátenna ti pabláak* means: he writes a notice; *surátanna ti papél* means: he writes on paper; *isúratna ti konák* means: he writes what I say.

However, the universally correct discrimination between the suffixes *en* and *an* and the prefix *i* has to be learned by use; for

⁴ Anthropos, Notes on Iloko 23 (1928) 1038, 1039.

example: *kabilen* means: to beat; *ikábil* means: to place.
Examples:

daytáy ti insaṅgpétda
aniá ti inpatáy ni amám
ikarik kenká
yúpermo ti kápas
inyálisda ti báṅga
idurón ni gayyémko
idáwatnak ken apóm
ápáy ṅga inlemmēṅgyo
yúlogmo ití saó ti ilóko
idissóda ti amiténdá
ikastóymo
inyárigna kenkuána
ikálida ti pása a natáy
ipúlāṅgyo ti binúlodyo
isublim ta inálam
iturédmo
yaplágda ti ikamén
iserréktayo ti págay

this is what they brought home.
of what did your father die?
I promise you.
dip the cotton in water.
they moved the pot.
my friend pushes him.
intercede for me with your master.
why did you hide it?
translate it into Iloko.
they put down what they carry.
do it so.
he compared it with him.
they bury the dead cat.
return what you borrowed.
bring back what you took.
stand it.
they spread the mat.
let us put the rice inside.

B. The prefix *i* is used especially with names of places, to form verbs meaning: to bring, to carry and so on, something into, on, or the like, the place indicated by the stem. Examples:

iruármo dagitáy
yunégda dagitá
iditóymo
idiáyna
yasidégmí
inyadayóyo
iṅgátom ta magaw-átko
ibabáda pay
inyabútmi

put these outside.
they put those inside.
put it here.
he puts it there.
we put it near.
you put it far away.
lift it up so that I can reach it.
they still lower it.
we put it in the hole.

B. COMBINATIONS

I. Adjectival: The prefix *i* may be joined to almost any adjectival prefix, in which case the whole combination remains adjectival, and the different forms of the simple adjectival prefix are used in these combinations. The prefix *i* adds to the adjectival prefixes its own instrumental meaning.

1. The prefix *agi* (past: *nagi*). Examples:

agisápulka no awán
siák ti agisúrat
nagibáleskami
inkayo agibilág ití págay
agiblénṅ
dikayo agilunód

look for some if there is none.
I shall write it down.
we took revenge.
go and sun the rice.
he relieves his bowels.
do not curse.

nagiruárda ití págay
agipagná ití nuáng
pagiwarnák
sadín ti pagibleñgán ti ubíng

agilásinka ití kayátmo
managikarí ngem awán ti itédna

aniá ti pagisañgpetánna kadagitá
ditóy
napalálo ti panagikárona kadagití
basbásolua
intonanó ti panagibatómi

they drew out rice.
 he brings a carabao around.
 newspaper.
 where does the boy relieve his
 bowels?
 put on one side whatever you like.
 he always promises but he gives
 nothing.
 why does he bring those here?
 he expiates his sins to excess.
 when do we throw stones?

2. The prefix *agkai* (past: *nagkai*). Examples:

agkaipigis ti bádok
agkaiwará ti lúpot
agkaisaroñggáñgat dagiti aspíli
nagkaisarombíñgit dagiti warnákan
agkaidissó ti bánja
agkaitibkúl ti lakáy
nagkairegrég ti bagásna
agkaiwáris dagiti bukél
agkaisublí ti súratko
aniá ti pagkaidissoán ti bánja ditóy
ti kuártok ti nagkaisaroñggáñgátan
dagiti dagum
masansán ti panagkairegrég ti ba-
gásna

my coat always gets torn.
 the clothes lie around.
 the pins lie around.
 the papers lie around.
 pots stand all over the ground.
 old men often stumble.
 his rice spilt all around.
 the seeds are scattered everywhere.
 my letters come back repeatedly.
 why do pots stand all around here?
 the needles lay all over my room.
 his rice is often spilt.

NOTE 4. We have seen under the adjectival prefix *ma* how the prefix *agka* gives the original term in *ma* something of an active meaning; the same happens with the prefix *agkai*: it gives the original term in *mai* something of an active meaning, and besides includes the notion of plurality, while the prefix *agkarai* includes that of repetition, and in this resembles the meaning of the reduplication of the first two syllables of the stem. Examples:

maisublí ti pirák: (the) money is brought back.
agkaisublí ti pirák: money comes back, several times, different money.
agkaraisublí ti pirák: the money comes back, continually, the same money.
agsublisublí ti ragádi: the saw goes back and forth.

3. The prefix *agkarai* (past: *nagkarai*). Examples:

agkaraibóoñg daytá ubíng
nagkaraitéd ti líñg-étina

agkaraipugsát ti tali
agkaraitublák
agkaraibalittádda

that child always breaks things.
 his perspiration trickled down abundantly.
 the rope snaps continually.
 he falls continually on his face.
 they turn over repeatedly.

<i>agkaraibelléñg iti bagás</i>	he always throws away rice.
<i>agkaraissublida</i>	they always return.
<i>agkaraipatáy ti sílaw</i>	the light goes out continually.
<i>aniá ti pagkaraiugtáran ti kabáyo</i>	why does the horse kick all the time?
<i>sadín ti nagkaraiipidítanna kadagiti bató</i>	where did he continually pick up stones?
<i>asin ti pagkaraitupráan ni lakáyko</i>	on whom does my husband continually spit?
<i>kasanó ti panagkaraidánug ti apómi</i>	how does our grandfather cuff all the time?

NOTE 5. The difference between *agkara* and *agkarai*, whenever they are used with the same stem, consists chiefly herein: *agkara* generally means that the subject suffers repeatedly the action indicated by the stem, *agkarai* generally means that the subject does repeatedly the action indicated by the stem. For example:

agkarakuddót: he is nipped continually.

agkaraiukuddót: he nips continually.

4. The prefix *makai* (past: *nakai*). Examples:

<i>diak makaitaráy kenkuána ta nadaysén</i>	I cannot run away with it because it is heavy.
<i>nakaipúpokda iti adú únay ñga ikán</i>	they caught many fish.
<i>isú ti makaigáwid kenkuána</i>	he it is who keeps him back.
<i>diak makaipán iti súrat</i>	I cannot carry the letter.

5. The prefix *makapagi* (past *nakapagi*), used very rarely. Examples:

<i>makapagiserrékka</i>	can you put them inside?
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6. The prefix *makipagi* (past: *nakipagi*), used very rarely. Example:

<i>siák ti nakipagiruár</i>	I helped bring them out.
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7. The prefixes *mañgi* and *mai* will be studied later.⁵

II. Substantival: The prefix *i* is used especially in the following combinations:

1. The prefix *i* and the suffix *an* (past: *in . . . an*); in this case there may be a double object in the nominative. This combination is used:

a. To indicate that something (first nominative on account of *i*) is done, made, and so on, for, in behalf of, somebody (second nominative on account of *an*). Examples:

<i>yaramidannak ti baláy</i>	make me a house.
<i>ingatánḡandakayo ti báwañḡ</i>	we bought garlic for you.
<i>isapulankanto ti nuáñḡ</i>	I shall look for a carabao for you.

⁵ The transitive prefix *mañḡ* and the prefix *ma*.

<i>idaitannaka ti bádo</i>	she will make you a coat.
<i>inbayoánna ti kabsátna</i>	she pounded rice for her sister.
<i>ilutoándakayo ti inapúy</i>	we shall cook rice for you.
<i>idawátannak ti árak</i>	ask wine for me.
<i>isagádanna ti inǵána</i>	she sweeps it for her friend.
<i>itabásandakami ti bádo</i>	they pattern out a coat for us.
<i>isubalítam ti okóm</i>	answer for the judge.
<i>inlakoánna ti gayyémko ti duá ñga</i>	he sold two dogs for my friend.
<i>áso</i>	
<i>isaoám ti bagím</i>	speak for yourself.
<i>ikitáannak ti limá</i>	look up five for me.

b. To indicate that the action or object implied in the stem is the means one uses to pay a debt, to earn something, and the like.⁶ Examples:

<i>idattak ti útanǵko</i>	I pay my debt sewing.
<i>inyablánna ti útanǵna</i>	she paid her debt weaving.
<i>indínǵoák ti limá salapí</i>	I earned two pesos fifty by raising animals.
<i>intalónak ti písos</i>	I earned a peso by working rice fields.
<i>yablák ken Pédro</i>	I earn it by weaving for Peter.
<i>inubiñǵák idá a duá</i>	I served both as a boy.

2. The prefix *ika* (past: *inka*). In this complex prefix the prefix *i* gives the verb its notion of instrumentality, and the stem with the prefix *ka* gives it its instrument. Examples:

<i>inkasigudna ti kinasiñǵpét</i>	he has always been virtuous.
<i>inkaubtñǵko toy lidáyko</i>	this sorrow of mine dates from my childhood.
<i>ikaláwana ti abút</i>	he widens the hole.
<i>inkalubbónmo ti ubtñǵ</i>	you joined the child to (the other one).

3. The prefix *ika* and the suffix *an* (past: *inka . . . an*). In this combination the prefix *i* gives the verb its notion of instrumentality, and the stem with the combination *ka . . . an* gives it its instrument. Examples:

<i>inkaubiñǵánna ti nakigubát</i>	he fought from childhood on.
<i>inkarigátanda ti bagida</i>	they chastised their bodies.
<i>ikarigátanda a biróken</i>	they do their utmost to find it.

4. The prefix *karai* (past and present). This prefix indicates repeated action; the difference between the combination *kara . . . en* and the complex prefix *karai* is the same as that between the suffix *en* and the prefix *i*. Examples:

karaikuddótnak
karaissublida ti págay

he nips me continually.
they always return the rice.

NOTE 6. A. The following combinations are used very rarely:

a. The prefix *itagi* (past: *intagi*). In this combination the prefix *tagi* adds the notion of property or possession to the simple prefix *i*. Example:

intagiláyonna ti biágko he preserved my life.

b. The prefix *ipaka* (past: *inpaka*). The prefix *paka* is the instrumental prefix derived from the prefix *maka*. Examples:

ipakaonák kadakayó I foretell you.
inpakaammóna ití gayyémna he imparted it to his friend.
inpakamaysána ti agádal he only thought of learning.

c. The prefix *ipaki* (past: *inpaki*). The prefix *paki* is the instrumental prefix derived from the prefix *maki*. Example:

ipakidáwatmo daytá kenkuána ask that from him.

d. The prefix *i* is used, although rarely, with some combinations indicating rivalry, reciprocity, and the like. Example:

kayátna nga igasangásat ti biágna he likes to risk his life.

B. The prefixes *isañga* (past: *insañga*), *isañgai* (past: *insañgai*) and *sañgkai* (past and present), having the notion of unity or concomitance combined with that of instrumentality, are of very rare occurrence and sometimes considered incorrect. Examples:

insañgapuorna kadakuáda ti káyo he burned wood with them.
isañgabílañgna he includes it in his account.
isañgadáwisko ti kabsátko I also coax my brother.
isañgabánñgonna he raises it also.
insañgaibáonna idá he sent them also.
sañgkaitúgotda ti bálonda they also take provisions with them.

4. THE PREFIX *IPA*

A. THE SIMPLE PREFIX

I. Form of the present: the prefix *ipa*; form of the past: the prefix *inpa*.

II. This prefix indicates:

1. Application, attribution, and the like. Examples:

ipakánmo ti págay ití kabáyo feed rice to the horse.
ipaáymo nga ayát ta yégmo please, bring it.
awán ti inpaáyna kaniák he gave me nothing.
ipatákawda ti áso ken Juán they accuse John of stealing the dog.
ipaanáka kenkuána daytá ubíñg they consider that child as his.
inpabásolmi kenkuána ti pannakapú-kawna we blamed him for its loss.
ipapánna a kastá he supposes it to be so.
inpabóoñgmi kenkuána ti piñgán we blamed him for breaking the plates.

ipainúmmo ti árak
awán ti ipasósóna ití anákna
ipapúdotmi ti dinéngdénġ
inpaárabda dagiti nuánġ

ipapilitna ti kayátna
ipagapóyo kaniák

give (him) wine to drink.
 she cannot give her child the breast.
 we heated the cooked vegetables.
 they brought the carabaos to the pas-
 ture.

he insists on what he likes.
 do it in consideration of me.

2. The use made of something. Examples:

awán ti bató ġnga ipapúnġanna
inpasúpótta ti kallogónġda
ipakuártata dagitoy a bató

inpasagaysáymi dagiti rámaymi
ipaárakna ti danúm
ipakátreyo ti datór
ipapalánġkatayo ti bató
inpapiñġgánda ti bulónġ ti sabá

he has no stone to use as a pillow.
 they used their hats for purses.
 let us use these pebbles as if they
 were money.
 we used our fingers for combs.
 he uses water as if it were wine.
 use the floor for a bed.
 let us use the stone for a chair.
 they used banana leaves for plates.

3. The direction in which something is put, brought, and so on. Examples:

iparabáwmo ití lamisáan
ipaamiánanmi dagitá
inpasúlida idá
ipababána ti labbá
ipañġátoto ti búrnáy
ipadáyada ti nuánġ
inpateñġñġámi ti/ubínġ
dakami ti ipaabagátanda
ipaláudtayo daytá
inpaigidda ti karretón

put it on the table.
 we carry those northward.
 they put them in the corner.
 he lowers the basket.
 hand up the jar.
 they bring the carabao eastward.
 we placed the child in the middle.
 it is us they carry southward.
 let us carry that one westward.
 they brought the cart near the edge.

NOTE 7. When the object has to be put in a certain direction with reference to another object, the combination *pakin . . . en* (past: the prefix *pinakin*) is used. We have seen that the prefix *akin* is followed by a glottal stop when the stem begins with a vowel; this prefix *pakin*, which is derived from *akin*, follows the same rule.

The combination *pakin . . . en* should really find its place under the verbs implying order or permission, but for the sake of convenience we place it here. After all, the prefix *ipa* itself is only a combination of *i* and *pa*, and should find its place under the same heading as *pakin . . . en*. Examples:

pinakinbabáda ti libro
pakin-unegém
pakinrabawém ti tinápay
pakindayénmi ti báka
pinakinñġátoda ti pan-áw
pakinñġatoénnaġ

they put the book beneath.
 put it on the inside.
 put the bread above.
 we put the cow at the east side.
 they put the cogon the uppermost.
 he lifts me above the rest.

B. COMBINATIONS

I. Adjectival: The complex prefix *agipa* with the different forms of the simple prefix *ag*, occurs sometimes but rarely. Examples:

<i>nalaiñg ñga agipapán</i>	he is very suspicious.
<i>agipatayánda ti tápok</i>	they throw up dust.
<i>nagiparuár kadagití báñga</i>	he brought the pots outside.
<i>awán ti pagiparuárko</i>	I have no means to bring them outside.
<i>ti dálan ti nagipatayabánna ití tápok</i>	he threw up dust in the road.
<i>kaanó ti panagipaárabmo kadakuáda</i>	when did you bring them to the pasture?

II. Substantival: The prefix *ipa* may be combined with other prefixes or suffixes, and the past form of *ipa* (*inpa*) is retained in these combinations, which are all very seldom met with.

1. The prefix *ipatagi*. Examples:

<i>ipatagiláyonmo kaniák</i>	preserve it for me.
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2. The prefix *ipasi*. Example:

<i>ipasinánamda</i>	they offer it to be tasted.
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3. The combination *ipa . . . an*, with a double nominative. Examples:

<i>ipakitáanna komá idá</i>	he should show it to them.
<i>inpatagikuáam</i>	you gave it to him as his property.
<i>ipaayánnak ti kayátko</i>	give me what I like.

5. THE PREFIX *MA*

I. Form of the present: the prefix *ma*; form of the past: the prefix *na*.

II. All the prefixes and suffixes of the Iloko substantival voice which may be combined with the adjectival prefix *ma* may also be combined with the substantival prefix *ma*; therefore we shall give examples of the use of this particular prefix later on.

III. This prefix indicates active possibility and, when used with the form of the past, indicates completion of the action. Examples:

<i>maarámidko ti konáyo</i>	I can do what you say.
<i>madáitko ti bádom</i>	I can sew your coat.
<i>matarimáanna no kayátyo</i>	he can arrange it if you like.
<i>malpásmi no bigát</i>	we shall finish it for tomorrow.
<i>nadánonko ti Kabúgaw</i>	I reached Kabugaw.
<i>nainúmko ámin ti árakda</i>	I drank all their wine.

<i>matíluymi ití nalaká</i>	we can continue it easily.
<i>manó ti maláonna</i>	how much does it hold?
<i>nalpásmi</i>	we finished it.
<i>nadáitko</i>	I sewed it.

NOTE 8. A. The complex prefix *masi* or *masin*, explained under the adjectival prefix *ma*, may also occur with the substantival construction. Example:

masipuónko daytáy a tali I can buy this entire rope.

B. The difference between the adjectival prefixes *maka*, *ma*, and the substantival prefix *ma* may best be illustrated in the following way:

- a. *makaarámidak ití baláy*: I can make a house (indeterminate).
maarámidko ti baláy: I can make the house (determinate).
maarámid ti baláy: the (or, a) house is made (passive).
- b. *nakaarámidak ití baláy*: I made (finished making) a house (indeterminate).

naarámidko ti baláy: I made (finished making) the house (determinate).
naarámid ti baláy: the (or, a) house was made (passive).

The adjectival prefix *maka* and the substantival prefix *ma* have both an active meaning (active possibility or completion of the action), the first being adjectival (indeterminate object), the second substantival (determinate object). The adjectival prefix *ma* represents the passive voice.

C. The difference between an ordinary substantival prefix or suffix and one combined with *ma*, may best be illustrated in the following way:

daitek ti bádo: I sew the coat.
madáitko ti bádo: I can sew the coat.
dináitko ti bádo: I sewed the coat (finished or not).
nadáitko ti bádo: I sewed the coat and finished it.

One may hear expressions like this:

dináitko ñgem diak pay nadáit: I sewed at it but did not yet finish it.

6. THE COMBINATION *PI . . . EN*

I. Form of the present: the prefix *pi* or *pin* and the suffix *en*; form of the past: the prefix *pini* or *pinin*.

NOTE 9. A glottal catch follows the prefix *in* whenever the stem begins with a vowel.

II. This combination is used with numbers to indicate how often something is done.⁷ Examples:

<i>piduám ti agtaráy</i>	run twice, run again.
<i>diákto piduáen ti agbásolen</i>	I shall not sin again.
<i>pinítlóna ti nagdáwaten</i>	he asked three times already.
<i>pin-innemém</i>	do it six times.

⁷ For the changes in prefix and number, see *The Substantive*. *Anthropos* 26 (1931) 473.

III. The following combinations occur sometimes, although rarely:

1. Adjectival:

a. The complex prefix *agpi* or *agpin*, with the different forms of the simple prefix *ag*. Examples:

<i>agpitlôka ñga agbáyo</i>	pound rice three times.
<i>agpinsántayo</i>	let us work together.
<i>sadín ti nagpinpatányo</i>	where did you do it four times?
<i>intonanó ti panagpinwaló ni Ana</i>	when will Ann do it eight times?

b. The complex prefix *pumi* or *pumin* (past: *pimmi* or *pimmin*). Examples:

<i>pumiduáka a pumidut</i>	pick things up twice.
<i>pimmin-innémkami</i>	we did it six times.

2. Substantival:

a. The prefix *ipi* or *ipin* (past: *inpi* or *inpin*). Examples:

<i>ipinpátmo a baliksén</i>	pronounce it four times.
<i>inpinlimáda ñga inbagá</i>	they said it five times.

b. The prefix *ikapi* or *ikapin* (past: *inkapi* or *inkapin*). Examples:

<i>ikapinpátma a mapán idiáy</i>	he goes there a fourth time.
<i>inkapinsíamna</i>	he did it a ninth time.
<i>inkapinpitóda</i>	they did it a seventh time.

7. THE COMBINATION *KA . . . EN*

I. Form of the present: the prefix *ka* and the suffix *en*; form of the past: the prefix *kina*.

II. This combination is used mostly with stems that imply the notion of quantity, time and so on, and forms verbs meaning: to augment, to retard, and so on. Examples:

<i>kaaduénna ti kanén</i>	he augments the food.
<i>kaatiddagényo daytá siñgdán</i>	lengthen that cord.
<i>kabayagénda ti agpátit</i>	they keep on ringing (the bells).
<i>kaladáwenda ti manḡán</i>	they put off eating.
<i>kaababaéntayo ti talí</i>	let us shorten the rope.
<i>kinasápami ti immáy</i>	we came earlier than usual.
<i>kinabassítá ti árak</i>	they diminished the wine.
<i>kinabiútmo ti naghuálo</i>	you shortened your praying.
<i>kañḡináenna ti ayátma</i>	he augments his charity (literally: he increases the value of his love).
<i>kalutoém daytá</i>	cook it well, thoroughly.

8. THE COMBINATION *KA . . . AN*

I. Form of the present: the prefix *ka* and the suffix *an*; form of the past: the prefix *kina* and the suffix *an*.

II. This combination is used with cardinal numbers to indicate to what number a lower one has to be increased.⁸
Examples:

<i>katloám</i>	make it three.
<i>kalímaánnakayo</i>	he increases your number to five.
<i>kinasiámanda dagiti nañgamit</i>	they caused those who carried them to be nine.
<i>kaduapuloánmi idá</i>	we increase their number to twenty.
<i>kinawaloányo dagiti ubbiñg</i>	you increased the number of the children to eight.

NOTE 10. Sometimes the simple suffix *an* is used instead of *ka . . . an*.
Example:

<i>talloánnakami</i>	he increases our number to three.
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9. VERBS IMPLYING ORDER OR PERMISSION

When we say order or permission, there is understood a whole amount of other subordinate meanings, which will be explained more extensively under the combination *pa . . . en*.

I. The notion of order or permission may bear either on the action, or on the subject, or on the object.

A. For instance, if the Iloko wants to order the action implied in the verbal stem *ságad* (sweeping), the order bearing on the action, he will say:

agpaságadak (an adjectival construction derived from an adjectival prefix), I order sweeping;

agpaságadak iti ubiñg, I order a boy (indeterminate or without stress) to sweep (anything, indeterminate);

agpaságadak iti silid, I order (somebody, indeterminate) to sweep the room (indeterminate or without stress).

B. If he wants to order somebody to sweep something, the order bearing on the subject of the adjectival verb, the subject of *agságad*, he says:

pagsagádek ti ubiñg (a substantival construction derived from an adjectival prefix), I order the boy (determinate or with stress) to sweep (anything, indeterminate);

pagsagádek ti ubiñg iti silid, I order the boy (determinate or with stress) to sweep the room (indeterminate or without stress).

C. If he wants to order something to be swept, the order bearing on the object of the substantival verb, the object of *sagádan*, he says:

⁸ For the changes in the number, see Cardinal Numbers, IV, Note 1. *Anthropos* 28 (1933) 711.

pasagáda *ti silid* (a substantival construction derived from a substantival suffix), I order the room (determinate or with stress) to be swept (by anybody, indeterminate);

pasagáda *ti silid ití ubiñg*, I order the room (determinate or with stress) to be swept by a boy (indeterminate or without stress).

II. Now as to the form of the verb:

A. When the order bears on the action, the prefix *pa* follows directly the original prefixes of the adjectival verbs, in the forms either of the present or of the past. These combinations are adjectival.

All the forms of the simple adjectival prefixes which have been studied in the preceding paper⁹ are of use here.

Here follow the most important combinations:

1. The prefix *agpa* (past: *nagpa*). Examples:

agpaálaak ití asín
isúda ti nagpasápul
awán ti agpaláko
nagpapúkiskami
nagpaatép kayo
dikam agpadenñngég kenkuána
agparigat ti lakáy
agpasokmón ti gayyémko
agpapaanák daytá bakét
managpabáutda
managpataráy dagití ubbiñg
addá pagpainúmmo

aniá ti nagpasagádam

pagpalaliwáan
ti pagpadpadagusán ti ilimí
awán ti pagpatagabuánmí

sadín ti nagpagatánngam
kaanó ti panagpalútomi
idí kalmán ti panagpaayádda
kasano ti panagpabirokmi

I send for salt.
 they had it looked for.
 nobody has it sold.
 we had our hair cut.
 did you have it roofed?
 we do not think he can hear.
 the old man is in a difficult position.
 my friend treats (us) to a drink.
 that old woman is a usurer.
 they always order whipping.
 the boys always have them run.
 have you something with which to
 give (them) to drink?
 why did you tell (them) to sweep
 (it)?
 consolation.
 the hotel of our town.
 we have no place where we can offer
 our services as servants.
 where did you have it bought?
 when will we have it cooked?
 they had (us) called yesterday.
 how can we have it looked for?

NOTE 11. a. The prefix *agpa* is also used to indicate direction toward the place indicated by the stem. It corresponds to the substantival prefix *ipa*. Examples:

nagpaláud itáy
agpabontókkami
agpadiitóy dagití agsakáy

he went westward just now.
 we go toward Bontok.
 the riders come in this direction.

⁹ Philip. Journ. Sci. 69 (1939) 223.

<i>nagpaabagátanda itáy malém</i>	they went southward this afternoon.
<i>agpaidiáyka</i>	go in that direction.
<i>nagpadayáanna ta nagbutéñg</i>	he went eastward because he was afraid.
<i>kaanó ti panagpaamiánanna</i>	when did he go northward?
<i>intóno bigát ti panagpalawágmi</i>	tomorrow we shall go toward Lawag.

b. The prefix *agpa* may be used with syncopated stems in which the last vowel is reduplicated.¹⁰ Examples:

<i>nagpalsúit dagiti ubbíñg</i>	the boys catapulted.
<i>agpaltóog or agpaltóg</i>	he shoots a gun.
<i>aniá ti pagpalsoótam</i>	why do you shoot your air gun?
<i>intonanó ti panagpalsúityo</i>	when will you catapult?

c. Other complex prefixes derived from the above: *agpai*, *agpa* . . . *inn* (rarely used), *agpinna*, *agpagin* (rarely used). Examples:

<i>agpaikábil ti lakáy</i>	the old man has it placed.
<i>aniá ti nagpaisuratanna</i>	why does he order it written?
<i>kaanó ti panagpaipánda</i>	when did they have it carried?
<i>nagpatitinnúlonгда</i>	they told (them) to help one another.
<i>agpinnaipánda</i>	they ask one another to carry it there.
<i>nagpipinnadáyaw dagiti kaaróbami</i>	our neighbors praised one another.
<i>aniá ti pagpipinnaayán dagitóy</i>	why do these ask one another to apply it?
<i>ksanó ti panagpipinnagásattayo</i>	how can we strive for the best luck?
<i>agpagintutúleñg</i>	he has (them) simulate deafness.

d. The prefix *agpañg* differs from *agpa* in the same way as the transitive prefix *mañg* differs from the intransitive prefix *ag*. Examples:

<i>agpañgasáwa ni Juan</i>	John marries off his son.
<i>agpammukél dagitóy ñga ubbíñgen</i>	these girls are getting breasts already (literally: have their breasts becoming round).
<i>isú ti pagpanakkélda</i>	that is what they use to have it grow.
<i>isú ti nagpannurayák</i>	he it was I waited for (for example, to take the lead; literally: whom I made the ruler, <i>turáy</i>).

2. The prefix *agpaka* (past: *nagpaka*). This form is used only in a few expressions. Examples:

<i>saan ñga agpakatúrog daytá ubíñg</i>	that child does not allow one to sleep.
<i>agpakarigat toy púsok</i>	this heart of mine is perplexed.
<i>nagpakatáo</i>	did he treat (you) as a man?
<i>dagiti agpakadinámag</i>	the renowned ones.

3. The prefix *makapa* (past: *nakapa*). Examples:

¹⁰ See The Adjectival Infix *An*.

makapabíleg ti árak
makapabaknáñg ti gagét
isú ti nakapasayáat iti baláymo

wine strengthens.
 thrift makes rich.
 that is what made your houses beautiful.

makapasiñgpét ti ánus
makapasúrotkayo iti maysá iti konáyo
róot a makapatúrog
makapakápuy iti bílegna
nakaparuród
makapagúra ti dákes a kadawían
aniá ti pakapapatiánna
sadino ti nakapapañgláwanna
kaanó ti pannakapadalápusna

patience makes virtuous.
 are you able to have even one believe what you say?
 narcotic herbs.
 it diminishes his strength.
 it made one angry.
 bad customs make one hate people.
 how can he make people believe?
 where did it make people poor?
 when did he jostle (them)?

NOTE 12. Another complex prefix derived from the above is *makapai* (past: *nakapai*). Example:

diak nakapaipán kadagitóy

I could not have these things carried there.

4. The prefix *makipa* (past: *nakipa*). Rarely used. Examples:

mapán makipaokóm
nakipataráyka
ínkayo makipainúm
nakipaálaak met
kaanó ti pannakipakútona

he also goes to be judged.
 you also had them run.
 go also to water them.
 I also had (them) brought.
 when did he also have it cooked?

NOTE 13. Another complex prefix derived from the above is *makipai* (past: *nakipai*). Rarely used. Examples:

napán nakipaisañgpét
siák ti nakipaibílin

he also went to have it brought in.
 I was the one who also had it ordered.

5. The complex prefixes derived from the simple prefix *mañg* will be explained later on.

B. When the order bears on the subject, the first consonant of the principal prefixes of the adjectival voice is changed into p, or a p is joined to the prefix if it begins with a vowel, and the suffix *en* is joined to the stem. For the past forms, instead of the suffix *en*, the infix *in* is inserted after the initial p. The only exception is the infix *um*, which is changed into the prefix *pa*: *pa . . . en* (past: prefix *pina*). These combinations are substantival.

When the simple prefix allows this combination, so do also generally the complex prefixes derived from that simple prefix; so, for example, if the simple prefix *ag*, which allows this combination (*pag . . . en*), is combined with other prefixes into

agi, agpa, and the like, the latter also allows these combinations, of *ag* (*pagi . . . en, pagpa . . . en*, and so on).

Here follow the most important combinations:

1. The prefix *ag* is changed into the combination *pag . . . en* (past: prefix *pinag*). Examples:

<i>pagsurátém ní Luís</i>	make Lewis write.
<i>paggatáñgenda tí gayyémko kadagiti áso</i>	they make my friend buy dogs.
<i>dakamí tí pagdaittenda</i>	we it is whom they order to sew.
<i>pinagáwidmi idá</i>	we sent them back.
<i>asíno tí pagtaktákem</i>	whom do you want to tarry?
<i>paggakadáentayo dagiti táo</i>	let us dismiss the men.
<i>pinagsublida dagiti kaaróbada</i>	they sent back their neighbors.
<i>ápáy a didakami pagtugawén</i>	why don't you make us sit down?
<i>pagbasáem tí anakmo</i>	send your child to school.
<i>pinaginanámi tí allawági</i>	we told the carpenters to rest.
<i>pagsaganáem ní Artúro ití pagid-daán</i>	tell Arthur to prepare the bed.
<i>pinagsaplítidak</i>	they told me to whip (them).
<i>pinagdátana</i>	he made him lie on his back.
<i>dínak pagmataén</i>	do you think I have no eyes?
<i>pinagarádomi tí ulitégmi</i>	we told our uncle to plow.
<i>pagbayabásenda tí bakét</i>	they tell the old woman to gather guavas.
<i>pinagsakitda tí amáda</i>	they made their father ill.
<i>pagmaestraénda ní Catalína</i>	they make a teacher of Catherine.
<i>pinagragáknakami tí íkitmi</i>	our aunt made us happy.
<i>paguppatém dagiti manḡamít</i>	make the carriers four.
<i>pagsintikem dagiti ubbíñḡ</i>	tell the children to play at marbles.
<i>pagkapamitloém</i>	make him do it a third time.
<i>pagkaduáem</i>	give him a companion.
<i>pinagkalúgan ní Juán dagiti an-nákna</i>	John told his children to ride in the same carriage.
<i>pinagkabbaláydakami</i>	they ordered us to live in the same house.
<i>pagsisinmublátenna idá</i>	he has them take turns.
<i>paglinnaiñgéntay idá</i>	let us have them vie with one another in cleverness.
<i>pagtinnulónḡem dagitá</i>	tell those to help one another.
<i>paggiginnasangasátentayo</i>	let us have them toss up.
<i>paglallalakiénda ní Ana</i>	they tell Ann to wear men's clothes.
<i>ápáy ta pagtagibunehḡéndak</i>	why do you make me carry a cutlass?
<i>pagtagilakoém ní Juána</i>	make a saleswoman of Joan.
<i>pinaginsasáñḡitda idá</i>	they told them to simulate weeping.
<i>paginpipiláyentayo ní Juán</i>	let us tell John to simulate lameness.
<i>pinagipánda dagiti ubbíñḡ</i>	they told the children to carry it there.
<i>pagirudrenna tí labútab</i>	he foams.

pagipaarábem ni gayyémko

tell my friend to bring (them) to the pasture.

pagpainumém ni Cárlos

tell Charles to water them.

pagpadigúsenyo ni Pédro iti kabáyo

tell Peter to bathe the horse.

pinagpalútomi ti kosinéro

we told the cook to have it cooked.

pinagpaálami ti gayyémni

we told our friend to have it taken.

2. The infix *um* is changed into the combination *pa. . . en* (past: prefix *pina*). We shall give here a few of the meanings of the ubiquitous *pa*, as we have stated before that the notions of order and permission are far from exclusive. We shall use as example the combination *pa. . . en*, and whatever is said about its different meanings and uses may be supplied, at least partially, wherever we state that a certain combination in *pag* or *pa* implies the notion of order or permission.

The combination *pa. . . en* is used:

a. To order somebody to do something. Examples:

paruárem dagiti áso

put the dogs out.

pinapánaawmi idá

we sent them away.

paayéntayo ti lakáy

let us tell the old man to come.

pinaadayó ti bakét dagiti ubbínġ

the old woman put the children aside.

patakderénda idá ámin

they make them all stand up.

dída pinaimbág

they did not cure them.

pasaduténda dagiti ubbínġda

they make their boys lazy.

parigátenda dagiti naganák kada-kuáda

they treat their parents hard.

pabanetbetém ti gayyémmo

tell your friend to strike with force.

pañġabaroánem ti biġmo

begin a new life.

pamauyónġenda ti kabsátda

they make their brother insane.

b. To allow somebody to do something. Examples:

pauliém idá

let them come up.

pasrekénda dagiti sañġaili

they let the strangers come in.

patugawéntayo ti lakáy

let us allow the old man to sit down.

pinainanámi ti masakít

we allowed the sick man to take a rest.

pinaiddáda ti ubínġ ta nabannóg

they allowed the child to lie down as it was tired.

dína pasuñġbáten idá

he does not allow them to answer.

c. To give something to somebody. Examples:

dagiti kakabsátko painuménda dagiti bakét

my brothers give the old women a drink.

pasosoénda dagiti annákda

they give their children the breast.

pinakánmi idá

we fed them.

padigúsen ti ubínġ dagiti nuánġ

the boy bathes the carabaos.

d. To allow something to happen. Examples:

<i>paruárem ti búlan</i>	wait till the moon rises.
<i>palenmekénda ti init</i>	they wait till sunset.
<i>pinastrawmi ti init</i>	we waited till sunrise.
<i>pinalábasmi idi kalmán</i>	we saw him pass yesterday.

e. To express one's opinion about somebody or something, and the like; rarely used. Examples:

<i>ápáy a dídak padeñggén</i>	do you think I have no ears?
<i>pababúyenmi digitá</i>	we use those as pigs.
<i>pinaásodatayo</i>	they treated us as dogs.
<i>pamanokéntayo daytá abúyo</i>	let us use that jungle fowl as a domestic cock.

NOTE 14. a. The difference between the combinations *pag . . . en* and *pa . . . en* is the same as that between the prefix *ag* and the infix *um*; the combination *pag . . . en*, from the prefix *ag*, means order, and the like, while the combination *pa . . . en*, from the infix *um*, rather means permission, and the like, or, when it means order it is always of less force and importance or less strict than the order, for example, implied in the combination *pag . . . en*. Examples:

<i>pagtugawém idá</i>	force them to sit down.
<i>patugawém idá</i>	allow them to sit down.
<i>pagdigúsenmi</i>	we force him to bathe.
<i>padigúsenmi</i>	we let him bathe.
<i>pinaginanáyo</i>	you made him rest.
<i>pinainanáyo</i>	you let him rest.
<i>paguráyentayo</i>	let us make him wait.
<i>pauráyentayo</i>	let us make him wait a while.
<i>pagsagádenda</i>	they make him sweep it.
<i>pasagádenda</i>	they make him sweep it a little.

b. To this combination *pa . . . en* belongs also the combination *pakin . . . en*, explained under the substantival prefix *ipa*. Examples:

<i>pakinbabaém ti libro</i>	put the book underneath.
<i>pinakinláudda ti anákko</i>	they placed my son west of (the others).

3. The prefix *maka* is changed into the combination *paka. . . en* (past: prefix *pinaka*). Examples:

<i>siák ti pakabasólenna</i>	it is I whom he forces to make a mistake.
<i>pinakañgñégna idá</i>	he made them hear.

4. The prefix *maki* is changed into the combination *paki. . . en* (past: prefix *pinaki*). Examples:

<i>pakiasawáem ni Ana</i>	give Ann in marriage.
<i>pakiintuódek kenká</i>	I tell him to ask you.

5. The prefix *mañg* is changed into the combination *pañg*. . . *en* (past: *pinañg*).¹¹ Examples:

<i>pañgaláem ti ubíñg iti págay</i>	tell the boy to take rice.
<i>pinañgbáutdak kenkuána</i>	they made me whip him.
<i>pamatiénna ti kabsátna iti saóna</i>	he makes his brother believe his words.
<i>pinamírokayo ti kaaróbayo iti áso</i>	you made your neighbor look for the dog.
<i>panalusénmi ti gayyémmi iti para-áñgan</i>	we make our friend clean the yard.
<i>pinaninnágko ni Ana iti bánga</i>	I made Ann drop the pot.
<i>pañgaramútentayo ti púsa iti kaá-daltayo</i>	let us make the cat scratch our class-mate.
<i>pinañgárusda ti lakáy iti lamisáan</i>	they made the old man scrape the table.
<i>paminduáenyó</i>	make him do it twice.
<i>pañgisurátenyo idá</i>	make them write it down.
<i>pañgpadígúsentayo</i>	let us force (him) to bathe (them).

NOTE 14. A few words, especially those extraordinary forms in *mañg*, as *mañgán*, for example, and in *ma*, as *matúrog*, for example, which, if they were ordinary adjectival verbs, should be formed with the prefix *ag* or the infix *um*, generally follow, in this instance, the rules of the same prefix *ag* or infix *um*, and their prefix becomes accordingly *pag* or *pa* with the suffix *en*. Examples:

<i>pakaném ti lakáy</i>	feed the old man.
<i>pinatúrogmi ti ubíñg</i>	we made the child sleep.
<i>pinagpagnáda ti bakét</i>	they made the old woman walk.

C. When the order bears on the object, the prefix *pa* (past: *pina*) is joined to the substantival verb as it is, its prefixes and suffixes remaining intact, except the suffix *en*, which is dropped. These combinations are substantival.

When the simple prefixes or suffixes allow this combination, so do also generally the combinations formed with these simple prefixes or suffixes; so, for example, if the original prefix *i*, which allows this combination (*pai*) is combined with the suffix *an*, the latter combination also allows this form *pai* (*pai*. . . *an*).

Here follow the most important combinations:

1. The suffix *en* is changed into the prefix *pa* (past: *pina*). Examples:

<i>paálam ti kallogónñgko</i>	send for my hat.
<i>pasápulko ti napúkawna</i>	I have (them) look for what he lost.
<i>pinapáрутmi ti róot kadagití ubbíñg</i>	we had the weeds pulled up by the children.

¹¹ See also the Transitive Prefix *Mañg*. Unpublished.

padáitminto ti bádomi
pasaklóttayo ti ubíng
pinatarimáanko ti nadadáel
pinalpásko kadagitá
painḡnḡgutko
paimbáña ti dákes
paapómi ni kabsátmo

paarámida ti saánmi a kayát

pasapínna toy lípot
pasaḡgapúlom dagiti waló
papisosyo
pinamatmatáda ti panagragáditayo
patagikuána ken Pédro
pasagduduána idá

we shall have a coat made for us.
 let us have the child borne in the lap.
 I had the spoiled things repaired.
 I had it finished by those.
 my beloved.
 he has the bad considered as good.
 we have your brother considered as
 the master.
 they cause to be made what we do
 not like.
 he has this cloth made into trousers.
 make the eight ten.
 make it a peso.
 they did our sawing by sight.
 he has it owned by Peter.
 he has them distributed two each.

NOTE 15. The substantival prefix *ipa*, explained in another part of this paper, should find its place here, as it is simply a combination of the instrumental prefix *i* with the above prefix *pa*. The difference in form between *ipa* and *pa* obviously consists in the respective presence and absence of the prefix *i*. Although in reality the difference in meaning also depends chiefly on the presence or absence of this particular prefix *i*, in practice it is not always easy to remember the notion of instrumentality connected with the prefix *ipa*. Therefore we give here a further illustration on the subject, so as to enable the student to distinguish easily between the two prefixes *ipa* and *pa*.

Whenever one wants to include in the verb the notion of application, it is necessary to use the prefix *ipa*, else the prefix *pa* should be used.

For example, to say: give water to be drunk, it will be necessary to say: *ipainúmmo ti daním*, because the water has to be applied to the one who drinks it; but when you want to say: cause water to be drunk, as there is no notion of application included in this sentence, it will be necessary to say: *painúmmo ti daním*.

And so also: *ipakánmo ti págay*, give rice to be eaten; but: *pakánmo ti pagáy*, have rice eaten.

These differences are obviously more or less theoretical, but in the following examples the importance of knowing very well the difference between the two, will be very clear and patent: *ipabóoḡmo kenkuána*: accuse him of breaking it; *pabóoḡmo kenkuána*: make him break it; *ipatákawko ken Juán ti pirák ti apók*: I accuse John of stealing the money of my master; *patákawko ken Juán ti pirák ti apók*: I tell John to steal the money of my master.

2. The suffix *an* is changed into the combination *pa. . . an* (past: *pina. . . an*). Examples:

pinaasinák ti digó
paraepák ti tálonko
paayabánmi ni Juán
pinatulóḡanda ti gayyémda
paluktántayo ti táwa

I had the broth salted.
 I have my rice field planted.
 we have John called.
 they had their friend helped.
 let us have the window opened.

pinakariánda ti gayyémko

paotnǎngányo ti bañgkáygo

pinasiloánda ti ásoni

pinanayónanmi

pakartibantayo daytáy

pasibugányo dagiti mǎla

paugásanna dagiti pinǎggán

pinadalusánna ti báñga

pinasukatánna ti danúmna

pinautánǎganna

padalapísanda

panagánantay ti ubíng

padawátantayo ti lakáy

pakissayánda

pinakawesán ni Juána ti duá a na-

pañgláw

they had my friend obliged to promise.

have cowpeas sown in your field.

they had our dog ensnared.

we had it augmented.

let us have a part of this cut off.

have the plants watered.

he has the dishes washed.

he had the pot cleaned.

he had its water changed.

he had it borrowed.

they have them jostled.

let us have the child named.

let us have the old man ask for it.

they have it diminished.

Joan had two poor persons clothed.

t

NOTE 16. This combination is also used with names of parts of the body, and means: to attach a person or an animal by that part of his body which is indicated by the stem. Examples:

patakiáganda ti anákda

pinasakáanda ti nuáñg

pasikétantay idá

pateñgñgedám ta áso

paluppoándakami

they attach their child by the arm.

they attached the carabao by the leg.

let us attach them by the waist.

attach that dog by the neck.

they attach us by the thigh.

3. The prefix *i* is changed into the complex prefix *pai* (past: *pinai*). Examples:

paipányo daytá

pinayégmi ditáy

pinayúlida ti págay

pairuármo

paikastóyyo

paibabáda

pinaitúgotmi ken Juán

pinaibúlosmi

paipalúbosmo daytá

paigátanǎngo ti manók

paibílinmi

paibítin ti agturáy

paiditáy ni Ana dagiti abél

paísrék ni kabsátko ti nayég a págay

have that carried there.

we had it brought here.

they had the rice brought in.

have it taken out.

have it done this way.

they have it brought down.

we told John to take it with him.

we had it loosened.

have that permitted.

I have it bought with a chicken.

we have it ordered.

the rulers have it hung up.

Ann has the clothes placed here.

my brother has the rice, which was brought, put inside.

they have a coat made for Joan.

we have people pound rice for Peter.

he had a house made for us.

they have it announced to his brothers.

paidaitanda ni Juána ti bádonga

paibayoánmi ni Pédro

pinayaramidannakami ti baláy

paipakaammóda kadagití kakabsátna

4. The prefix *ipa* is changed into the complex prefix *paipa* (past: *pinaipa*). Examples:

<i>paipadáyayo</i>	have it put eastward.
<i>pinaipañgátoda</i>	they had it put upward.
<i>pinaipakánmi ti págay iti kabáyo</i>	we had rice fed to the horse.
<i>paipagtéñgmi kadakayó</i>	we have it brought toward you.
<i>paipapúnnganmo ti bató</i>	have the stone used as a pillow.
<i>paipainúmno daytá árak</i>	cause that wine to be given to drink.
<i>paipatagudinmo</i>	have it brought toward Tagudin.
<i>pinaipaabagátan ni Juan dagiti báka</i>	John had the cows brought southward.

5. The combinations *pi. . . en* and *pin. . . en*, and the complex prefixes *ipi* and *ipin*, *ikapi* and *ikapin*, are changed into the complex prefixes *papi* (past: *pinapi*) and *papin* (past: *pinapin*), *paipi* (past: *pinaipi*) and *paipin* (past: *pinaipin*), *paikapi* (past: *pinaikapi*) and *paikapin* (past: *pinaikapin*), respectively. Examples:

<i>papiduám</i>	have it done twice.
<i>papinpátda toy panagtaráyna</i>	they have this running of his done four times.
<i>pinaipinpitóda</i>	they had it done seven times.
<i>pinaipitlóda</i>	they had it done three times.
<i>paikapitlóm</i>	have it done for the third time.
<i>pinaikapinwalóna</i>	he had it done for the eighth time.

D. The construction in which the prefix *pa* is combined with the prefixes and suffixes of the substantival voice may become adjectival, and in this case the verb obtains a reflexive meaning, and the order or permission bears on the subject of this adjectival verb. Examples:

<i>paubíngka</i>	offer your services as a servant.
<i>pasaplítkami kenkrúana</i>	we have ourselves beaten by him.
<i>saánka komá a paábak iti dákes</i>	do not let yourself be overcome by evil.
<i>saának ñga umáy paawit kadakayó</i>	I do not come to have myself carried by you.
<i>paasáwaka</i>	offer yourself in marriage.
<i>madadáanak a pabílin kenká</i>	I am ready to let myself be ordered by you.
<i>patpatúrog a pagan-ándy</i>	nightgowns.
<i>pabígbigka a síká ti okóm</i>	let yourself be considered as the judge.
<i>duá a pababáon</i>	two servants (to be sent).
<i>pínabilbilínak</i>	I became a servant.
<i>pinatiliw kayo</i>	you let yourselves be caught.

patartarakénkami

pabuniágankayo kenkuána
dika paayótan kadakuáda

pabantáyanak ta dákes ti ugálik

umáyda paisalákan
dika paikáwa ken ladiñgit

paidurón dagitá
paikáyogak kenká
paiturayánkayto
paipalnédka
paipaárab dagiti nuáñg

we have ourselves brought up (by others).

have yourselves baptized by him.
do not let yourself be coaxed by them.

I have myself watched because I have bad habits.

they come to have themselves saved.
do not let yourself be broken down by grief.

those have themselves pushed.

I let you take me with you.

you will let yourselves be ruled.

have yourself disappear.

the carabaos have themselves brought to the pasture.

III. As may be seen in the preceding explanations, the past form of the combination *pa. . . en*, from the adjectival infix, *um*, is the same as that of the prefix *pa*, from the substantival suffix *en*. Both past forms allow the same prefix *pina*, so that confusion might arise in their use. To illustrate these two combinations, and at the same time to show clearly the difference between the four combinations where the prefix *pa* enters, and between the different ways how order or permission may be expressed, we shall give the following example about a man beating a boy by order of myself.

1. Sentences without any notion of order or permission:

a. Adjectival prefix *ag*:

agbáut ti táo: the man beats.

Adjectival infix *um*:

bumáut ti táo: the man beats.

b. Substantival suffix *en*:

baúten ti táo tí ubiñg: the man beats the boy.

2. Sentences with the notion of order or permission.

A. Bearing on the action (adjectival):

(a) *agpabáutak*: I order beating.

B. Bearing on the subject of the adjectival verb, the man (substantival):

(a) (*ag*) *pagbaútek ti táo iti ubiñg*: I tell the man to beat the boy. (*um*) *pabaútek ti táo iti ubiñg*: I tell the man to beat the boy. (past) *Pinabáutko ti táo iti ubiñg*: I told the man to beat the boy.

C. Bearing on the object of the substantival verb, the boy (substantival) :

- (b) *pabáutko ti ubíng ití táo*: I have the boy beaten by the man.
 (past) *Pinabáutko ti ubíng ití táo*: I had the boy beaten by the man.

D. Bearing reflexively on the subject of the adjectival verb:

- (b) *pabáut ti táo*: the man lets himself be beaten. (past *pínabáut ti táo*: the man let himself be beaten. *pabáut ti ubíng ití táo*: the boy lets himself be beaten by the man. *pabáutak*; I let myself be beaten.

NEW OR LITTLE-KNOWN TIPULIDÆ FROM EASTERN ASIA (DIPTERA), XLI

By CHARLES P. ALEXANDER

Of Amherst, Massachusetts

FOUR PLATES

The present report is based on extensive collections of crane flies that were secured in northern Korea (Chosen) by Mr. Alexander Yankovsky. The general conditions under which these collections were made have been discussed in connection with the preceding report under this general title.¹ In 1938 Mr. Yankovsky made very extensive collections at various altitudes in the Seren Mountains, and many of the most interesting species herein described were then taken. I am very greatly indebted to Mr. Yankovsky for his continued interest in collecting these flies. The types of all novelties are preserved in my private collection of the Tipulidæ.

LIMONINÆ

LIMONIINI

LIMONIA (LIMONIA) PARVIPENNIS sp. nov. Plate 1, fig. 1; Plate 2, fig. 25.

Allied to *tanakai*; wings very small but not at all degenerate nor with distorted venation; general coloration of thorax yellow, unmarked; antennal flagellum dark brown to black; halteres uniformly pale yellow; femora yellow, tips narrowly but conspicuously blackened; wings brownish yellow, sparsely patterned with darker; m-cu at fork of M; abdomen elongate, caudal borders of second to seventh segments, inclusive, conspicuously banded with brown; terminal two segments uniformly black; ninth tergite of male hypopygium without rounded lateral lobes.

Male.—Length, about 8 millimeters; wing, 5.

Rostrum and palpi black. Antennæ with scape and pedicel obscure yellow; flagellum dark brown to black; flagellar segments oval to long-oval, verticils elongate. Head obscure yellow,

¹ Philip. Journ. Sci. 67 (1938) 129-166.

center of vertex infuscated; anterior vertex wide, approximately two times diameter of scape.

Pronotum brownish black, paling to yellow on sides. Mesonotum and pleura uniformly polished yellow, unmarked. Halteres uniformly pale yellow. Legs yellow; tips of femora narrowly but conspicuously blackened, the amount equal on all legs; tibiae more obscure yellow, tips very narrowly darkened; basitarsi passing through obscure yellow to black; remainder of tarsi black. Wings (Plate 1, fig. 1) unusually small as compared to length of body, much shorter than abdomen but not at all distorted in shape or venation; ground color brownish yellow, prearcular and costal fields clearer yellow; stigma suboval, medium brown; very restricted brown seams at origin of Rs, fork of Sc, cord and outer end of cell 1st M_2 ; a vague dusky wash in cell R; veins pale brown, more luteous in yellow areas. Venation: Sc moderately long, Sc_1 ending shortly before midlength of Rs, Sc_2 longer, ending opposite this point; Rs long, arcuated; cell 1st M_2 about as long as vein M_4 beyond it; m-cu at or close to fork of M; anal veins divergent.

Abdomen unusually long and conspicuous, segments correspondingly lengthened; yellow, caudal borders of second to seventh segments, inclusive, conspicuously brown; eighth segment and hypopygium black. Male hypopygium (Plate 2, fig. 25) with caudal margin of tergite, 9t, with a broad U-shaped notch. Ventromesal lobe of basistyle very low to scarcely developed; setae lacking on cephalic portion of basistyle. Dististyle, *d*, entirely black, broad at base, narrowest just beyond midlength, apex narrowed and prolonged, tip obtuse. Gonapophyses, *g*, with mesal apical lobe long and spinelike, terminating in an acute pale spike, surface back from apex with conspicuous setae. Aedeagus, *a*, broad at base, terminating in two parallel, recurved spines.

Habitat.—Northern Korea.

Holotype, male, Seren Mountains, altitude 4,000 feet, July 10, 1938 (Yankovsky).

This curious fly is most closely related to *Limonia* (*Limonia*) *tanakai* (Alexander), having the same peculiar type of hypopygium; that is, a single dististyle constricted at near midlength, spinous hairy mesal-apical lobes of gonapophyses, and paired recurved apical spines of aedeagus. The present fly differs conspicuously in several important features, notably the brown

antennal flagellum, unusually small wings and correspondingly lengthened abdomen, m-cu at the fork of M, banded abdominal segments, and in the details of structure of the male hypopygium, as the less extended and expanded apices of the dististyles and the lack of obtusely rounded tergal lobes. The grotesquely small wings and lengthened abdomen give this insect a very peculiar appearance.

LIMONIA (DICRANOMYIA) PARVILOBA sp. nov. Plate 1, fig. 2; Plate 2, fig. 26.

Belongs to the *morio* group and subgroup; male hypopygium with tergal lobes moderately long, separated by a broad notch; basistyle with ventromesal lobe small; dorsal dististyle acute at tip; gonapophyses simple, mesal-apical lobes terminating in subacute to weakly bidentate points.

Male.—Length, about 5 to 5.5 millimeters; wing, 5.8 to 6.5.

Female.—Length, about 6 to 6.5 millimeters; wing, 6 to 7.

Rostrum and palpi black. Antennæ black throughout; flagellar segments passing through oval to long-oval; terminal segment subequal to penultimate. Head with front and broad anterior vertex silvery; posterior part of head black.

Thorax polished black, pleura a little more gray-pruinose. Halteres with stem obscure yellow, knob brownish black. Legs with coxæ black, posterior pair more reddish; trochanters yellow; fore femora black, only narrow bases obscure yellow; remaining femora yellow, tips passing into black, narrowest on posterior pair; tibiæ and tarsi obscure yellow, outer tarsal segments darkened. Wings (Plate 1, fig. 2) with a brownish-yellow tinge, prearcular field clearer yellow; stigma small, brown; veins brown. Venation: Sc ending approximately opposite origin of Rs, Sc₂ some distance from its tip; m-cu close to fork of M.

Abdomen black, intermediate segments broadly ringed with reddish; hypopygium black. Male hypopygium (Plate 2, fig. 26) with tergal lobes, 9*t*, moderately long, separated by a broad notch that is usually wider than long, in cases with breadth and length subequal. Ventromesal lobe of basistyle, *b*, small, with coarse marginal setæ. Dorsal dististyle, *dd*, acute at tip. Ventral dististyle, *vd*, profoundly divided, as in subgroup; rostrum elongate. Gonapophyses, *g*, simple, mesal-apical lobe terminating in subacute or weakly bidentate points. Ædeagus, *a*, broad, nearly parallel-sided, lateral margins with delicate setulæ, apex abruptly narrowed and set off by square shoulders.

Habitat.—Northern Korea.

Holotype, male, Seren Mountains, altitude 4,000 feet, July 10, 1938 (Yankovsky). Allotopotype, female, altitude 3,000 feet, July 10, 1938. Paratopotypes, 5 males and females, altitude 3,000 to 4,500 feet, June 30 to July 19, 1938; paratypes, males and females, Ompo, altitude 200 to 500 feet, May 28 to June 9, 1938.

This is the first member of the *morio* subgroup discovered in eastern Asia. Among the described species, including the Nearctic *Limonia* (*Dicranomyia*) *nycteris* (Alexander) and the western Palearctic *L. (D.) caledonica* (Edwards), *L. (D.) morio* (Fabricius), and *L. (D.) stylifera* (Lackschewitz), the present fly is closest to *caledonica*, differing especially in the hypopygial features, such as the unusually small lobe of the basistyle and the structure of the gonapophyses.

LIMONIA (DICRANOMYIA) PARVILOBA PARVINCISA subsp. nov. Plate 2, fig. 27.

Differs from the typical form in the structure of the male hypopygium (Plate 2, fig. 27): notch of ninth tergite, 9t, small, subcircular in outline. Gonapophyses, *g*, with mesal-apical lobe obtuse at tip.

Habitat.—Northern Korea.

Holotype, male, Ompo, altitude 200 feet, May 28, 1938 (Yankovsky).

Allotopotype, female. Paratopotype, male.

LIMONIA (DICRANOMYIA) IMMODESTOIDES (Alexander).

Dicranomyia immodestoides ALEXANDER, Ann. Ent. Soc. America 12 (1919) 327, 328.

Northern Korea, Seren Mountains, altitude 5,000 feet, September 15, 1938 (Yankovsky).

LIMONIA (DICRANOMYIA) TRISTIS (Schummel).

Limnobia tristis SCHUMMEL, Beitr. zur Entomol. (1829) 135.

Northern Korea, Seren Mountains, altitude 3,000 feet, June 15, 1938 (Yankovsky). Very similar to typical material from central Europe. The only difference is that in the male hypopygium of the present fly the most cephalic tubercle on mesal face of basistyle is slightly longer than in European specimens.

ANTOCHA (ANTOCHA) BIFIDA Alexander.

Antocha (Antocha) bifida ALEXANDER, Philip. Journ. Sci. 24 (1924) 564-566.

Northern Korea, Seren Mountains, altitude 3,000 feet, June 30, 1938 (Yankovsky).

ANTOCHA (ANTOCHA) INTEGRÆ sp. nov. Plate 1, fig. 3; Plate 2, fig. 28.

General coloration ochreous, præscutum darkened medially in front; antennal flagellum black; head light gray; halteres with stem pale, knob dark brown; legs long and conspicuous, femora black, with bases restrictedly brightened; wings whitish subhyaline, prearcular field milky white, stigma scarcely differentiated; veins brown, conspicuous against ground; male hypopygium with outer dististyle dilated at apex into a blade, its margin scarcely or but feebly emarginate; ædeagus with subtending apical lobes very pale and hyaline.

Male.—Length, about 6 millimeters; wing, 6.5.

Rostrum yellow; palpi black. Antennæ short; scape and pedicel yellow above, darker beneath; flagellum black; flagellar segments oval, clothed with a conspicuous white pubescence. Head light gray.

Pronotum infuscated medially, yellow on sides. Mesonotum ochreous; præscutum darkened medially in front and in vicinity of pseudosutural foveæ, virtually immaculate behind. Pleura yellow, anepisternum and sternopleurite somewhat more darkened. Halteres with stem pale, knob dark brown. Legs with coxæ testaceous yellow, fore pair darker; trochanters yellow; legs long and conspicuous, femora black, only bases restrictedly brightened; tibiæ and basitarsi light brown, outer tarsal segments dark brown; claws with a single, very slender, subbasal spine. Wings (Plate 1, fig. 3) whitish subhyaline, prearcular field more milky white; stigma scarcely differentiated, pale; veins brown, conspicuous against ground, whitened in prearcular field. Venation: Rs long but still somewhat shorter than in *brevistyla*; cell 1st M₂ more pointed at proximal end.

Abdomen light brown; subterminal segments dark brown; hypopygium brownish yellow. Male hypopygium (Plate 2, fig. 28) with basistyle, *b*, at proximal end on mesal face produced into a small setiferous lobe. Outer dististyle, *od*, strongly curved, at apex dilated into a long triangular head, apex obliquely truncated to very feebly notched, not conspicuously emarginate, as in *brevistyla*. Inner dististyle, *id*, strongly curved, a little dilated on outer half, provided with abundant setæ. Ædeagus, *a*, with subtending apical lobes very pale and hyaline, not appearing as sclerotized oval lobes, as in *brevistyla*.

Habitat.—Northern Korea.

Holotype, male, Ompo, altitude 800 feet, July 13, 1938 (Yankovsky).

Antocha (Antocha) integra is most nearly allied to *A. (A.) brevistyla* Alexander and *A. (A.) sagana* Alexander, agreeing in the general conformation of the dististyles and in the presence of a small setiferous lobe on the mesal face of basistyle. It appears to be closest to *brevistyla*, especially in the long conspicuous legs and the distinct wing veins, differing in the details of structure of the male hypopygium, especially the simple apical blade of the outer dististyle and the feebly sclerotized outer lateral lobes of the ædeagus. *A. (A.) sagana* is much smaller, with pale wing veins that are ill-defined against the ground, and with the details of structure of the male hypopygium distinct.

PEDICIINI

PEDICIA (NASITERNELLA) HOKKAIDENSIS Alexander.

Pedicia (Nasiternella) hokkaidensis ALEXANDER, Philip. Journ. Sci. 53 (1934) 278, 279.

Northern Korea: Seren Mountains, altitude 3,000 to 4,500 feet, June 17 to 30, 1938 (*Yankovsky*). It seems virtually assured that both *hokkaidensis* and the Nearctic *hyperborea* (Osten Sacken) will prove to represent at most geographical races of *variinervis* (Zetterstedt).

DICRANOTA (EUDICRANOTA) PERDISTINCTA sp. nov. Plate 1, fig. 4; Plate 2, fig. 29.

General coloration pale yellow; halteres elongate; wings pale yellow, very restrictedly patterned with brown on crossveins and deflections; a supernumerary crossvein in cell R_1 ; R_s angulated to square at origin; cell R_4 long-petiolate, petiole a little more than one-third length of cell; cell 1st M_2 closed; cell M_1 long-petiolate; male hypopygium with dististyle at apex bearing numerous blackened peglike spines.

Male.—Length, about 6 to 7 millimeters; wing, 6 to 7.5; antenna, about 1.

Female.—Length, about 5.5 millimeters; wing, 5.

Rostrum obscure yellow; palpi pale brown. Antennæ yellow, outer flagellar segments weakly infuscated; antennæ 12- to 14-segmented, basal two or three flagellar segments crowded, with ill-defined sutures; outer segments oval, terminal segment smaller than penultimate. Head pale yellow.

Thorax uniformly pale yellow, notum dusted with whitish. Halteres elongate, pale yellow. Legs yellow, tips of femora narrowly and weakly infuscated, tips of tibiæ still more narrowly blackened; tarsi yellow, tips of individual segments narrowly darkened, outer segments uniformly infuscated. In female

femoral tips undarkened. • Wings (Plate 1, fig. 4) with a pale yellow tinge, very restrictedly patterned with brown, appearing as narrow seams at origin of Rs, Sc₂, cord, outer end of cell 1st M₂, R₂, and supernumerary crossvein in cell R₁; veins pale yellow, darkened in clouded areas. Venation: Sc₁ ending opposite or shortly before supernumerary crossvein in cell R₁; Sc₂ at near middistance between arculus and origin of Rs; Rs angulated to square at origin, in cases short-spurred; R₂ oblique, fusion with R₁ very short; supernumerary crossvein in cell R₁ variable in position, usually just before level of fork of R₄₊₅; cell R₄ with petiole a little more than one-third length of cell; cell 1st M₂ closed, with m-cu at or very close to fork of M; petiole of cell M₁ long, from one and one-half to twice length of cell.

Abdomen obscure yellow. Male hypopygium (Plate 2, fig. 29) with dististyle, *d*, single, pale, expanded outwardly, truncated apex set with numerous peglike spines. Basistyle, *b*, long; interbasal rod pale, broad at base, narrowed into a long sinuous point. What appear to represent extensions of the tergite, *9t*, are evidently stouter and more powerful submedian horns that gradually narrow to very pale acute points, the expanded subbasal portions with several pale punctures.

Habitat.—Northern Korea.

Holotype, male, Ompo, altitude 200 feet, May 24, 1938 (Yankovsky).

Allotopotype, female, altitude 700 feet, June 9, 1938. Paratopotypes, 3 males, altitude 300 to 700 feet, May 28 to June 9, 1938 (Yankovsky).

The present fly is well-distinguished from the two species of *Eudicranota* hitherto described, *D. (E.) notabilis* Alexander and *D. (E.) pallida* Alexander, of eastern North America, by the venation, especially the long petioles of cells R₄ and M₁. In the Asiatic fauna the fly is entirely different from all other known species of *Dicranota*.

DICRANOTA (DICRANOTA) YEZOENSIS COREANA subsp. nov.

Female.—Length, about 7 millimeters; wing, 8.

Close to typical form. Antennæ 13-segmented; flagellar segments oval, first a little less than twice second; third segment a little smaller than penultimate. Mesonotal præscutum with median stripe virtually entire, with a scarcely evident pale median vitta. Wings with venation much as in *yezoensis*; Sc₂ closer to origin of Rs, distance about three-fourths R alone;

petiole of cell R_3 very short, less than basal section of R_5 ; cell M_3 deeper, M_{3+4} and M_4 subequal. Macrotrichia of veins shorter. Abdominal segments uniformly brownish black, caudal borders not pale.

Habitat.—Northern Korea.

Holotype, female, Seren Mountains, altitude 2,800 feet, June 15, 1938 (Yankovsky).

HEXATOMINI

LIMNOPHILA (ELÆOPHILA) PERSALSA sp. nov. Plate 1, fig. 5; Plate 2, fig. 30.

General coloration dark brownish gray, præscutum with four ill-defined darker brown stripes on posterior half; basal flagellar segments pale; halteres pale yellow; legs yellow, tips of femora narrowly but abruptly black; wings broad, pale cream-yellow, heavily patterned with brown, areas confined to vicinity of veins; male hypopygium with outer dististyle relatively broad, terminating in a slender appressed spine, outer margin on distal half with microscopic teeth.

Male.—Length, about 6.5 to 7.5 millimeters; wing, 7 to 8.

Female.—Length, about 7 millimeters; wing, 7.5.

Rostrum black, pruinose, palpi black. Antennæ with scape and pedicel black; basal two or three flagellar segments yellow, remaining segments passing into brown; flagellar segments long-oval, with conspicuous verticils. Head gray.

Pronotum and mesonotum dark brownish gray, præscutum with four ill-defined darker brown stripes on posterior half, obliterated on anterior portion; pseudosutural foveæ black. Pleura dark brownish gray. Halteres pale yellow. Legs with coxæ light brown, fore pair darker; trochanters obscure yellow; femora yellow, tips narrowly but abruptly blackened, the amount subequal on all legs; tibiæ pale yellow, tips very narrowly darkened; tarsi pale yellow, outer two segments blackened. Wings (Plate 1, fig. 5) broad; ground color pale cream-yellow, heavily patterned with solid dark-brown areas that are restricted to vicinity of veins, including a larger costal series at h, origin of R_s , fork of Sc , and stigma and tips of veins R_3 and R_4 ; dark area at origin of R_s in transverse alignment with other major darkenings at supernumerary cross-vein in cell M and at tip of vein $2d$ A , forming an almost complete band at this point; no dark marking basad of this band in cell $2d$ A ; other, more restricted, dark areas at cord, outer end of cell $1st$ M_2 , fork of M_{1+2} , and as marginal clouds at ends of longitudinal veins; veins yellow, darker in clouded

areas. Venation: R_{2+3+4} long, in direct alignment with Rs ; R_2 beyond fork of R_{2+3+4} , subequal to R_{2+3} ; cell 1st M_2 narrow, with m-cu at near one-third length; supernumerary crossvein in cell M opposite or just before origin of Rs .

Abdomen dark brown, caudal borders of segments still darker; hypopygium dark brown. Male hypopygium (Plate 2, fig. 30) with outer dististyle, *od*, relatively broad, terminating in a slender appressed spine; outer margin on distal half with microscopic teeth, most basal one not or only slightly larger; inner margin on outer third microscopically crenulate or with small obtuse teeth. Inner dististyle entirely pale.

Habitat.—Northern Korea.

Holotype, male, Seren Mountains, altitude 3,700 feet, June 30, 1938 (*Yankovsky*). Allotopotype, female. Paratopotypes, 5 males, altitude 3,000 to 3,700 feet, June 17 to July 5, 1938 (*Yankovsky*).

Limnophila (*Elæophila*) *persalsa* is quite distinct from the other regional species of the subgenus. The broad cream-yellow wings, with markings restricted to the vicinity of the veins, and the structure of the male hypopygium, especially of the outer dististyle, furnish strong specific characters.

LIMNOPHILA (ELÆOPHILA) SERENENSIS sp. nov. Plate 1, fig. 6; Plate 2, fig. 31.

General coloration brownish gray, præscutum with four brown marks; antennæ short, brownish black throughout; mediotergite gray, posterior border broadly dark brown; femora yellow, tips conspicuously and abruptly blackened; wings whitish subhyaline, with certain cells washed with darker; a conspicuous darker-brown pattern that is confined to vicinity of veins; wings relatively narrow; male hypopygium with lateral spine of outer dististyle appressed.

Male.—Length, about 6 millimeters; wing, 6.6.

Rostrum and palpi black. Antennæ brownish black throughout, relatively short, if bent backward scarcely attaining wing root. Head gray.

Mesonotal præscutum brownish gray, intermediate stripes a little darker, especially two linear dashes at posterior ends; a circular brown spot on either side of intermediate stripes, nearly opposite black pseudosutural foveæ; posterior sclerites of mesonotum dark gray, centers of scutal lobes a little darker; posterior border of mediotergite broadly dark brown. Pleura gray, variegated with dark-brown spots. Halteres pale yellow. Legs with coxæ brown; trochanters brownish

yellow; femora yellow, tips conspicuously and abruptly black, the amount subequal on all legs; tibiae yellow, tips narrowly dark brown; tarsi yellow, terminal segments darker. Wings (Plate 1, fig. 6) whitish subhyaline; certain cells, especially M, Cu, bases of anal cells, and along vein R_5 , weakly infumed; a conspicuous darker-brown pattern that is restricted to vicinity of veins, including a series of about seven costal areas, smallest at h, largest at origin of R_s , fork of Sc , and stigma; narrower seams along cord, outer end of cell 1st M_2 , supernumerary crossvein in cell M, and fork of M_{1+2} ; a marginal series of small spots at ends of veins M_1 to 2d A, inclusive; no dark spot basad of cloud at end of vein 2d A; veins yellow, dark in clouded areas. Wings relatively narrow, not dilated in male. Venation: Cell 1st M_2 relatively small.

Abdominal tergites dark brown, sparsely pruinose; basal portions of sternites variegated by obscure yellow; hypopygium brownish yellow. Male hypopygium (Plate 2, fig. 31) with basistyle, *b*, slender. Outer dististyle, *od*, generally smooth, except at apex; lateral spine appressed; apical spine slender, with microscopic spinulae back from base.

Habitat.—Northern Korea.

Holotype, male, Seren Mountains, altitude 4,000 feet, October 9, 1937 (*Yankovsky*).

Limnophila (*Elæophila*) *serenensis* is most similar to *L. (E.) subaprilina* Alexander, of Japan, agreeing in the general nature of the wing pattern, with all dark areas confined to the vicinity of the veins and without interpolated dots in the interspaces as in the majority of the species in Asia. It differs in the abruptly blackened femoral tips, the pattern of the thorax, and the details of the wing pattern, as the lack of a supplementary dark cloud in cell 2d A. In the European fauna both *L. (E.) maculata* (*Meigen*) and *L. (E.) submarmorata* Verrall show an unusual range of color forms that have been treated as varieties by Edwards.²

LIMNOPHILA (ELÆOPHILA) SUBAPRILINA YEZOENSIS Alexander.

Northern Korea, Seren Mountains, altitude 2,000 to 4,000 feet, August 8, 1938 (*Yankovsky*). As in typical *subaprilina*, the present fly has a major darkened cloud in cells 1st A and 2d A, lying proximad of the smaller dark area at end of vein 2d A.

² Trans. Soc. Brit. Ent. pt. 1 5 (1938) 1-168, 5 pls., 31 figs.

LIMNOPHILA (ADELPHOMYIA) MACROTRICHIATA Alexander. Plate 1, fig. 7.

Limnophila (Lasiomastix) macrotrichiata ALEXANDER, Ann. Ent. Soc. America 16 (1923) 65, 66.

Northern Korea, Ompo, altitude 300 to 500 feet, June 15 to 23, 1937; May 20 to 29, 1938 (Yankovsky). In these specimens the lower lobe of the inner dististyle of the male hypopygium is proportionately a little shorter than the outer lobe than in the holotype specimen (Teshio, Kokkaido, Japan). The wing venation is shown in Plate 1, fig. 7.

LIMNOPHILA (PRIONOLABIS) ACANTHOPHORA Alexander.

Limnophila (Prionolabis) acanthophora ALEXANDER, Philip. Journ. Sci. 67 (1938) 157, 158.

Described from a single male specimen. Numerous further specimens, Seren Mountains, altitude 2,000 to 3,800 feet, June 25 to 30, 1938 (Yankovsky). Some male specimens are much smaller than the type (Male, length, about 6.5 to 7.5 millimeters; wing, 8.5 to 9) but are undoubtedly conspecific. The single female specimen taken indicates that this sex is subapterous, as is likewise the case in *L. (P.) imanishii* Alexander, *L. (P.) luteibasalis* Alexander, and *L. (P.) nigrilunæ* Tokunaga, all of the main island of Japan. The present fly differs from these others in the relatively larger wings, with accompanying differences in pattern venation.

Female.—Length, about 10 millimeters; wing, 3.5 by 0.7.

Antennæ 16-segmented, dark throughout; basal flagellar segments short, outer segments elongate and comparatively slender; outer three segments subequal. Head black, sparsely pruinose, more heavily so in front. Mesonotum black, surface subnitidous; pleura more heavily pruinose. Halteres broken. Legs with coxæ and trochanters black; remainder of legs black, femoral bases restrictedly yellow. Wings subatrophied, relatively narrow, as shown by the measurements, yet much larger than in other regional species having subapterous females; wings strongly yellow, slightly more brownish yellow outwardly; veins yellow, beyond cord darker and with long coarse setæ; costal fringe unusually long and dense, except at base where setæ are short, pale, and subappressed; costal fringe extending to beyond wing tip. Venation agreeing approximately with that of male but reduced, due to the shape and size of the wings. Abdomen opaque black; ovipositor with elongate valves; cerci brown; hypovalvæ black, more intense basally.

Allotype, female, Ompo, northern Korea, altitude 200 feet, May 29, 1938 (Yankovsky).

LIMNOPHILA YANKOVSKYANA sp. nov. Plate 1, fig. 8; Plate 2, fig. 32.

General coloration polished black; antennæ (male) very long, nearly as long as body; femora black, extreme bases paler; tibiæ brown, tips black; wings brownish yellow, sparsely patterned with brown; cell R_3 sessile or very short-petiolate; cell M_1 lacking; male hypopygium with outer dististyle blackened, profoundly split into two unequal acute spines.

Male.—Length, about 6.5 to 7 millimeters; wing, 7.2 to 8; antennæ, about 6 to 6.2.

Rostrum and palpi black. Antennæ black throughout, elongate, as shown by the measurements, being only a little shorter than entire body; flagellar segments cylindrical, very long; intermediate segments subequal, outer segments gradually shorter; terminal segment about one-third length of penultimate; flagellar segments with abundant, coarse, erect setæ and slightly longer subbasal verticils. Head dull black; anterior vertex wide, approximately three times diameter of scape; anterior vertex with a low tubercle.

Thorax uniformly polished black; præscutal setæ relatively short and small. Halteres with stem obscure whitish, knobs weakly darkened. Legs with coxæ black; trochanters brownish black; femora black, only extreme bases paler; tibiæ brown, tips blackened; tarsi black. Wings (Plate 1, fig. 8) brownish yellow, a little more yellowish on basal and costal portions; stigma oval, pale brown; barely evident dark seams on cord and along outer end of cell 1st M_2 ; veins brown, a little brighter in costal and prearcular fields. Venation: Sc_1 ending shortly before fork of R_s , Sc_2 at its tip, subequal; cell R_3 usually sessile, so R_s is in direct alignment with R_4 ; in cases with a very short petiole, R_{2+3+4} ; cell M_1 lacking; m shorter than basal section of M_3 , sometimes very short; $m-cu$ variable in position, usually close to midlength of cell 1st M_2 , in other cases a little before or beyond.

Abdomen, including hypopygium, shiny black. Male hypopygium (Plate 2, fig. 32) with outer dististyle, *od*, blackened, deeply and unequally divided into two long, acute spines, outer spine shorter, apex microscopically tuberculate; inner spine stout. Inner dististyle, *id*, simple, stout and fleshy, narrow tip obtusely rounded.

Habitat.—Northern Korea.

Holotype, male, Seren Mountains, altitude 5,000 feet, July 10, 1938 (Yankovsky). Paratopotypes, 6 males, altitude 2,500 to 5,000 feet, July 3 to 19, 1938 (Yankovsky).

I take great pleasure in naming this very distinct fly in honor of the collector, Mr. Alexander Yankovsky, who has added vastly to our knowledge of the tipulid fauna of northern Korea. The general appearance of the fly is much like that of a *Prionolabis*, but I hesitate to refer it to this subgenus. It is very different from all other known species in eastern Asia. The western Palæarctic *Limnophila longeantennata* Strobl has somewhat similarly lengthened antennæ but is otherwise entirely different.

ERIOPTERINI

RHABDOMASTIX (SACANDAGA) NIGROAPICATA sp. nov. Plate 3, fig. 33.

Male.—Length, about 5 to 5.5 millimeters; wing, 6 to 6.5; antennæ, about 1.2.

Female.—Length, about 5.5 to 7.5 millimeters; wing, 6 to 8.

Generally similar to *R. (S.) japonica* Alexander, differing chiefly in the coloration of the legs. Compared with *japonica* the following distinctions are present: Median præscutal stripes distinct, darkened in front, usually entire and with surface faintly nitidous; in occasional specimens median stripe split by a narrow pale median line. Flagellar segments longer, with very long conspicuous verticils. Tips of femora conspicuously blackened, bases and tips of tibiæ more narrowly so; tarsal segments beyond basitarsi passing into brown. Abdominal tergites uniformly yellowish brown to pale brown.

In *japonica* four separate præscutal stripes, surface opaque. Tips of femora and bases and tips of tibiæ not or scarcely darkened. Abdominal tergites weakly bicolored, bases darker than outer portions.

Wings with Sc long, Sc₁ ending about opposite four-fifths length of Rs, Sc₂ some distance from its tip, Sc₁ alone exceeding m-cu; R₃ suberect; R₂₊₃₊₄ and R₄ subequal in length; distance on costa between tips of R₁₊₂ and R₃ subequal to length of latter; m-cu close to midlength of cell 1st M₂. No macrotrichia on R₃; a complete series of trichia on R₄ and usually one or two on distal portion of R₂₊₃₊₄. Male hypopygium (Plate 3, fig. 33) with outer dististyle, *od*, relatively stout, pale, almost parallel-sided, outer face with numerous

appressed spines, apex a strongly retrose point. Inner dististyle, *id*, short and stout, narrowed to blunt apex. Gonapophyses, *g*, with apical blade moderately dilated.

Habitat.—Northern Korea.

Holotype, male Seren Mountains, altitude 2,500 feet, June 30, 1938 (*Yankovsky*). Allotopotype, female, altitude 4,000 feet, July 10, 1938. Paratopotypes, males and females, altitude 1,800 to 4,000 feet, June 26 to July 10, 1938.

I am not familiar with the male sex of *Rhabdomastix japonica* and so cannot compare the hypopygial characters.

RHABDOMASTIX (SACANDAGA) USURIENSIS Alexander.

Rhabdomastix (Sacandaga) usuriensis ALEXANDER, Proc. U. S. N. M. Art. 4 68 (1925) 13.

Described from eastern Siberia. Northern Korea, Ompo, altitude 200 feet, May 25 to June, 3, 1938; Seren Mountains, altitude 3,000 to 3,500 feet, June 17 to July 3, 1938 (*Yankovsky*).

RHABDOMASTIX (SACANDAGA) SPATULIFERA sp. nov. Plate 1, fig. 9; Plate 2, fig. 24.

General coloration dark gray, præscutum without distinct stripes; halteres pale yellow; femora obscure yellow, tips darkened, most extensively so on forelegs; wings broad, grayish, bases narrowly brightened; stigma and a seam behind vein Cu light brown; numerous macrotrichia on most veins beyond cord; Sc₁ ending about opposite two-thirds length of Rs; male hypopygium with apices of gonapophyses expanded into short, broad, yellow blades.

Male.—Length, about 6 millimeters; wing, 7; antennæ, about 1.2.

Rostrum dark gray; palpi black. Antennæ black, of moderate length, if bent backward ending shortly before wing root; flagellar segments passing through oval to elongate, verticils exceeding segments. Head light gray.

Thorax uniformly dark, gray-pruinose, without evident præscutal stripes; scutellum unbrightened. Halteres pale yellow. Legs with coxæ brown, more or less pruinose, especially fore pair; trochanters testaceous yellow; femora obscure yellow, tips darkened, widest on forelegs where about outer two-thirds is included, narrowest on posterior pair; tibiæ obscure yellow, tips narrowly darkened; tarsi dark brown, basitarsi paler. Wings (Plate 1, fig. 9) broad, grayish, base more brightened; stigma and a seam behind vein Cu light brown; veins pale brown, more yellowish in prearcular and costal portions. Ma-

crotrichia on all longitudinal veins beyond cord with the exception of R_3 and basal portion of R_{2+3+4} . Venation: Sc_1 ending about opposite two-thirds length of Rs , Sc_2 near its tip; R_{2+3+4} slightly shorter than R_4 ; R_3 short, suberect; veins issuing from cell 1st M_2 not conspicuously arched, m and basal section of M_3 subequal; $m-cu$ at near one-third length of cell 1st M_2 .

Abdomen dark brown, including hypopygium. Male hypopygium (Plate 3, fig. 34) with outer dististyle, *od*, relatively stout, apex a decurved acute spine. Inner dististyle, *id*, with apex suddenly narrowed into a cylindrical point. Gonapophyses, *g*, at apex expanded into short, broad, yellow blades.

Habitat.—Northern Korea.

Holotype, male, Seren Mountains, altitude 2,800 feet, July 5, 1938 (Yankovsky). Paratopotype, male, altitude 3,000 feet, July 5, 1938.

Rhabdomastix (*Sacandaga*) *spatulifera* is very different from the other described regional species, especially in the general coloration and in the structure of the male hypopygium, notably of the gonapophyses.

RHABDOMASTIX (SACANDAGA) LURIDOIDES sp. nov. Plate 1, fig. 10; Plate 3, fig. 35.

Belongs to the *lurida* group; general coloration dark, scutellum and lateral borders of præscutum obscure yellow; halteres pale yellow; femora yellow, tips broadly blackened, widest on forelegs; wings brownish yellow, proximal half brighter, including veins; vein Sc_2 lacking; R_3 oblique, with macrotrichia over entire length; male hypopygium with gonapophyses unusually long, strongly curved, narrowed to acute blackened points.

Male.—Length, about 5 to 5.5 millimeters; wing, 5.5 to 6.

Female.—Length, about 6 millimeters; wing, 6.

Rostrum black, sparsely pruinose; palpi black. Antennæ with scape and pedicel black, flagellum brownish black; flagellar segments passing through oval to long-oval, longest verticils unilaterally distributed. Head dark gray.

Anterior lateral pretergites light yellow. Thorax black, sparsely pruinose, lateral margins of præscutum and posterior border of scutellum broadly obscure yellow; in female, præscutal interspaces indicated by narrow reddish lines before suture; in cases sides of mediotergite and pleurotergite obscure yellow, in other specimens these more darkened. Pleura chiefly dark, variegated with obscure yellow; dorsopleural membrane obscure yellow. Halteres pale yellow. Legs with

coxæ obscure yellow; trochanters yellow; femora yellow basally, tips brownish black, widest on forelegs where about outer half is darkened, narrowest on posterior femora where about distal seventh is infuscated; tibiæ brownish yellow, tips narrowly darkened; tarsi brownish yellow, passing into dark brown. Wings (Plate 1, fig. 10) brownish yellow, proximal half somewhat clearer yellow; veins brown in outer portions, yellow in basal areas. Numerous macrotrichia on longitudinal veins beyond cord, including entire length of R_3 . Venation: Sc_1 ending nearly opposite fork of R_s , Sc_2 lacking; R_s long, exceeding twice R_{2+3+4} ; R_3 very oblique, as in the group; cell 1st M_2 relatively small, shorter than vein M_4 beyond it; m-cu close to midlength of cell 1st M_2 .

Abdomen black, sparsely pruinose; hypopygium brownish yellow. Male hypopygium (Plate 3, fig. 35) with gonapophyses, g , unusually long, strongly curved, narrowed to long, acute, blackened points.

Habitat.—Northern Korea.

Holotype, male, Seren Mountains, altitude 4,000 feet, July 19, 1938 (Yankovsky). Allotopotype, female. Paratopotypes, several of both sexes, altitude 3,500 to 5,000 feet, July 10 to August 2, 1938 (Yankovsky).

Allied to the western Palearctic *Rhadomastix* (*Sacandaga*) *lurida* (Loew) and *R. (S.) inclinata* Edwards, differing especially in the structure of the male hypopygium, as the unusually long and slender, curved gonapophyses. Further undescribed member of the group occurs in the Rocky Mountain area of western North America. The strongly oblique R_3 , with macrotrichia throughout its length, together with the loss of vein Sc_2 , as well as the structure of the male hypopygium, as the acutely pointed gonapophyses, mark the group as very distinct.

CRYPTOLABIS (BÆOURA) SEPTENTRIONALIS sp. nov. Plate 1, fig. 11; Plate 3, fig. 36.

Belongs to the *aliena* group; general coloration gray, præscutum with four slightly more blackish stripes; anterior lateral pretergites restrictedly brightened; halteres infuscated; legs black, only femoral bases restrictedly brightened; wings brownish gray, stigma and vague seams on cord and in axillary region darker; male hypopygium with dististyle moderately slender, penis very long and slender.

Male.—Length, about 4 millimeters; wing, 4.5.

Female.—Length, about 4.5 millimeters; wing, 4.5.

Rostrum black, sparsely pruinose. Antennæ short, black throughout. Head light ashy gray.

Pronotum light gray; anterior lateral pretergites restrictedly obscure yellow. Mesonotal præscutum dark gray; lighter on sides, disc with four slightly more blackish stripes; scutum dark gray; scutellum dark basally, apical border broadly orange; postnotum dark gray. Pleura heavily gray-pruinose; dorso-pleural membrane obscure yellow. Halteres infuscated throughout. Legs with coxæ dark gray; trochanters brown; remainder of legs black, femoral bases, especially of posterior legs, obscure yellow. Wings (Plate 1, fig. 11) broad, tinged with brownish gray, prearcular field slightly more yellowish; stigma pale brown, ill-defined but extensive; a vague dark suffusion at cord; axillary region weakly darkened; veins dark brown, brightened in prearcular field, somewhat more intensely darkened along cord. Venation: R_{2+3+4} a little longer than basal section of R_5 ; m-cu shortly before midlength of M_{3+4} ; cell 2d A wide.

Abdomen brownish black, including genitalia of both sexes. Male hypopygium (Plate 3, fig. 36) with ventral lobe of basistyle, *b*, long and conspicuous. Dististyle, *d*, of moderate length and slenderness, sinuous, more dilated on proximal third, central portion with five or six small setiferous tubercles; distal third with numerous, very small, pale punctures; apex obtuse. *Ædeagus*, *a*, terminating in two small pale blades; penis very long and slender.

Habitat.—Northern Korea.

Holotype, male, Seren Mountains, altitude 3,000 feet, July 16, 1938 (*Yankovsky*). Allotopotype, female, altitude 4,500 feet, July 16, 1938.

Cryptolabis (Bæoura) septentrionalis is very distinct from the other known regional species of the subgenus. In the very elongate *ædeagus* and penis it resembles *C. (B.) dicladura* Alexander and *C. (B.) perductilis* Alexander, of southern and western China, differing very conspicuously in the structure of the dististyle. This is the most northerly representative of *Bæoura* so far discovered.

ORMOSIA (ORMOSIA) DEVOTA sp. nov. Plate 1, fig. 12; Plate 3, fig. 37.

General coloration gray; antennal flagellum pale brown; halteres obscure yellow; legs brown; wings grayish, stigma a little darker than ground; macrotrichia of cells long and dense; cell 1st M_2 small, closed; m-cu at fork of M; vein 2d A moderately sinuous; male hypopygium with two simple disti-

styles, outer broader, slightly enlarged, and set with dense rows of scales; inner dististyles slender, at apex slightly enlarged and bearing two powerful setæ.

Male.—Length, about 6 millimeters; wing, 6.5; antennæ, about, 1.4.

Rostrum and palpi black. Antennæ moderately long; basal two segments somewhat darker brown than flagellum; outer flagellar segments elongate-cylindrical, with verticils considerably longer than segments and unilaterally distributed. Head gray, with abundant pale pubescence.

Mesonotum gray, central portion of præscutum more brownish gray but without distinct stripes; pubescence of thorax long and pale. Pleura dark gray; a conspicuous group of long yellow setæ on pleurotergite. Halteres obscure yellow. Legs with coxæ dark gray; trochanters brown; remainder of legs brown. Wings (Plate 1, fig. 12) grayish, prearcular field restrictedly yellow; stigma a little darker than ground; cord vaguely seamed with darker; veins brown, trichia a little darker, long, and dense (indicated in figure by stippling). Venation: Sc_2 about opposite midlength of comparatively short straight R_s ; R_2 close to fork of R_{2+3+4} ; cell 1st M_2 small, closed, shorter than any of veins issuing from it; m-cu at fork of M ; vein 2d A moderately sinuous.

Abdomen dark brown, hypopygium a little brightened. Male hypopygium (Plate 3, fig. 37) with two simple dististyles, outer, *od*, broader, slightly enlarged outwardly, apex with dense rows of flattened scales. Inner dististyle, *id*, subequal in length but slender, at apex with a spinous point on one side; two terminal setæ, one shorter and slenderer, the second long and strong, directed more or less backward. Phallosome, *p*, difficult to describe from the unique slide mount, appearing as two flattened apophyses on either side of an urn-shaped spinulose median structure.

Habitat.—Northern Korea.

Holotype, male, Seren Mountains, altitude 4,000 feet, July 10, 1938 (Yankovsky).

Ormosia (*Ormosia*) *devota* is entirely different from all known species of the genus. From other gray species having cell 1st M_2 closed it differs in the structure of the male hypopygium which somewhat suggests that of species of the *vivitata* group yet is quite distinct. The clavate squamose head of the outer dististyle is much as in species of the otherwise

distinct *similis* group in *Ormosia* and in certain other eriop-
terine groups.

ORMOSIA (ORMOSIA) CATA sp. nov. Plate 1, fig. 13; Plate 3, fig. 38.

General coloration polished black; antennæ black throughout; head gray; anterior lateral pretergites light yellow; thoracic pleura gray-pruinose; femora yellow, tips abruptly blackened, broadest on forelegs; wings with a faint dusky tinge, prearcular and costal portions clear light yellow, stigma brown; R_2 close to base of cell R_3 ; cell 1st M_2 closed, with m-cu close to its inner end; anal veins divergent; male hypopygium with inner dististyle a simple blackened rod; ædeagus slender, terminating in a small sagittate head.

Male.—Length, about 4.5 millimeters; wing, 5.5.

Rostrum and palpi black. Antennæ black throughout, moderately elongate, if bent backward extending approximately to wing root; flagellar segments oval, with a dense white pubescence. Head gray.

Pronotum black, sparsely pruinose; anterior lateral pretergites abruptly light yellow. Mesonotum almost uniformly polished black, præscutum very weakly pruinose on lateral portions; posterior lateral portions of scutal lobes obscure yellow. Pleura black, heavily dusted with gray; dorsopleural membrane dusky. Halteres with stem obscure yellow, knob clear yellow. Legs with coxæ brownish yellow, fore pair somewhat darker; trochanters yellow; femora yellow, tips conspicuously blackened, most extensively so on forelegs where about the distal half is darkened, narrower on other legs, including about outer fifth or sixth; tibiæ obscure yellow, tips darkened; tarsi dark brown. Wings (Plate 1, fig. 13) with a faint dusky tinge, prearcular and costal regions clear light yellow; stigma oval, dark brown; a scarcely evident darkening along vein Cu in cell M; veins dark brown, yellow in flavous portions. Macrotrichia covering almost whole wing surface (indicated in figure by stippling). Venation: R_2 close to fork of R_{2+3+4} and base of cell R_3 ; cell 1st M_2 closed, m-cu close to its inner end; anal veins divergent, 2d A gently sinuous.

Abdomen, black, hypopygium somewhat brightened. Male hypopygium (Plate 3, fig. 38) with the tergal lobes, 9*t*, small, gently divergent, separated by a U-shaped notch. Basistyle, *b*, with conspicuous dorsal and ventral lobes. Outer dististyle, *od*, large, club-shaped, bearing a sclerotized fingerlike rod on mar-

gin. Inner dististyle a slender, simple, blackened rod. What seem to represent gonapophyses, *g*, appear as flattened blades, the outer angle of each produced into an acute spine. *Æ*deagus, *a*, slender, terminating in a small sagittate head, apex obtuse.

Habitat.—Northern Korea.

Holotype, male, Seren Mountains, altitude 2,800 feet, July 5, 1938 (Yankovsky).

Ormosa (Ormosa) cata is very distinct from all described regional species, being most similar to *O. (O.) prava* sp. nov., described below. It is well distinguished by the color of the wings and legs, venation, and the structure of the male hypopygium.

ORMOSIA (ORMOSIA) PRAVA sp. nov. Plate 1, fig. 14; Plate 3, fig. 39.

General coloration polished black; halteres with bright yellow knobs; femora black, bases obscure yellow, involving basal third or a little more; wings brownish yellow, costal region clearer yellow; a conspicuous brown pattern including stigma and broad seams at cord and along vein Cu; R_{2+3+4} short, R_{2+8} preserved; cell 1st M_2 closed; m-cu beyond fork of M; anal veins divergent; male hypopygium with inner dististyle a broad blackened plate that is produced laterad into a strong black spine.

Male.—Length, about 6 millimeters; wing, 7; antennæ, about 2.

Female.—Length, about 7 to 7.5 millimeters; wing, 6.5 to 8.

Rostrum and palpi black. Antennæ black throughout; flagellar segments oval. Head dark gray.

Pronotum black; anterior lateral pretergites obscure brownish yellow. Mesonotum polished black, surface not or scarcely pruinose. Pleura black, sparsely dusted with gray; dorsopleural membrane brownish black. Halteres with stem dusky, knob bright yellow. Legs with coxæ black; trochanters reddish brown; femora black, bases obscure yellow, involving proximal third or a little more; tibiæ brownish black to black, both ends somewhat darker; tarsi black. Wings (Plate 1, fig. 14) with ground color brownish yellow, prearcular field and costal region clearer yellow; stigma and broad conspicuous seams at origin of Rs, cord and outer end of cell 1st M_2 , and along vein Cu, dark brown; anal cells washed with somewhat paler brown, especially on basal portions; some of longitudinal veins beyond cord very narrowly seamed with brown; veins coarse, dark brown, more yellowish in brightened costal portions. Macrotrichia of cells abundant, lacking only at wing base (indicated

in figure by stippling). Venation: R_{2+3+4} short to very short, subequal to R_{2+3} , R_2 thus beyond fork of R_{2+3+4} ; cell 1st M_2 closed, varying from short to longer rectangular; m-cu shortly beyond fork of M ; anal veins divergent. In one paratype, on both wings, outer third of distal section of vein M_{1+2} atrophied.

Abdomen black, subnitidous, including hypopygium and genital shield of female; cerci of latter pale yellow to light horn-colored. Male hypopygium (Plate 3, fig. 39) with what appears to be the tergite, $9t$, narrowly transverse, produced caudad into a broad pale membrane, more sclerotized basal portions with punctures, remainder with only microscopic pubescence. Basistyle, b , with mesal lobe longer and more pointed than outer lobe. Outer dististyle, od , a massive clavate structure whose true extent and conformation is difficult to decide in the type and which is evidently more complex than illustrated, the head with abundant long coarse setæ. Inner dististyle, id , a broad blackened plate, its apex produced laterad into a long, strong, black spine. \AA edeagus, a , terminating in two rods that are recurved at tips into short spines. The conspicuous plate-like apophyses of the related *O. cata* seem to have no homologues in this species.

Habitat.—Northern Korea.

Holotype, male, Seren Mountains, altitude 3,000 feet, July 5, 1938 (*Yankovsky*). Allotopotype, female, altitude 2,500 feet, June 17, 1938. Paratopotypes, 6 females, altitude 3,000 to 3,200 feet, June 15 to 30, 1938.

The nearest relative is *Ormosia* (*Ormosia*) *cata* sp. nov., which has the general coloration similarly polished black. The present fly differs in the larger size, heavily patterned wings, distinct leg pattern, and especially in the very different male hypopygium.

ORMOSIA (ORMOSIA) DUCALIS Alexander.

Ormosia (*Ormosia*) *ducalis* ALEXANDER, Philip. Journ. Sci. 67 (1938) 162, 163.

This very distinct fly has been known from the unique type. Numerous specimens, Ompo, Northern Korea, altitude 200 to 700 feet, May 18 to 28, 1938; Seren Mountains, altitude 2,500 to 4,200 feet, June 18 to July 3, 1938 (*Yankovsky*).

ORMOSIA (ORMOSIA) YANKOVSKYI sp. nov. Plate 1, fig. 15; Plate 3, fig. 40.

General coloration pale yellow; antennæ brown; femora and tibiæ yellow, tips narrowly but conspicuously blackened, tarsi uniformly black; wings yellow, veins pale and indistinct; cells

M₂ open by atrophy of m; male hypopygium with phallosome heavily blackened, asymmetrical.

Male.—Length, about 4 to 4.2 millimeters; wing, 4 to 4.5.

Female.—Length, about 4.5 millimeters; wing, 4.5 to 4.8.

Rostrum brownish testaceous; palpi dark brown. Antennæ brown; flagellar segments oval. Head brown.

Thorax uniformly pale yellow, without clearly defined markings. Halteres pale yellow. Legs with coxæ and trochanters yellow; femora yellow, tips narrowly but abruptly brownish black, the amount subequal on all legs; tibiæ yellow, tips conspicuously blackened, the amount about twice as extensive as femoral darkening; tarsi black. Wings (Plate 1, fig. 15) with a uniform pale yellow tinge, veins a little deeper colored but inconspicuous against ground. Macrotrichia well distributed (indicated in figure by stippling). Venation: Sc short, Sc₁ ending about opposite fork of Rs; cell R₃ deep; cell M₂ open by atrophy of m; m-cu close to fork of M; vein 2d A short and nearly straight.

Abdomen, including hypopygium, yellow, tergites a trifle darker. Male hypopygium (Plate 3, fig. 40) with both dististyles simple, pale; outer style slender, surface with microscopic appressed spines. Inner dististyle, *id*, a trifle longer, tip obtuse with a few setæ at apex. Phallosome, *p*, heavily blackened, asymmetrical, including a cylindrical lateral rod with apex obtuse.

Habitat.—Northern Korea.

Holotype, male, Ompo, altitude 200 feet, May 18, 1938 (Yankovsky). Allotopotype, female. Paratopotypes, numerous specimens of both sexes, altitude 100 to 800 feet, May 18 to 29, 1938; paratypes, Seren Mountains, altitude 3,000 to 4,500 feet, June 21 to July 18, 1938 (Yankovsky).

Allied to *Ormosia* (*Ormosia*) *confluenta* Alexander, of Japan, differing conspicuously in the pattern of the legs and in the structure of the male hypopygium, as the heavily blackened phallosome. I take very great pleasure in dedicating this fly to the collector, Mr. Alexander Yankovsky.

ORMOSIA (ORMOSIA) CORNUTOIDES sp. nov. Plate 1, fig. 16; Plate 3, fig. 41.

General coloration dark gray; antennæ dark throughout; halteres pale yellow; femora obscure yellow, passing into dark brown; wings pale yellow, stigma brown, conspicuous; vein R₂ close to fork of R₂₊₃₊₄; cell M₂ open by atrophy of basal section

of M_3 ; vein 2d A moderately sinuous; male hypopygium with inner margin of outer dististyle produced into a strong spine; inner dististyle conspicuously spinous; gonapophyses appearing as slender yellow rods that are connected with broadly flattened plates subtending ædeagus.

Male.—Length, about 4 to 4.5 millimeters; wing, 4.5 to 5.5; antennæ, about 1 to 1.2.

Female.—Length, about 4.5 to 5 millimeters; wing, 5 to 5.5.

Rostrum and palpi black. Antennæ of moderate length; scape and pedicel black, flagellum dark brown; flagellar segments oval. Head dark gray.

Mesonotum dark gray, unmarked; setæ of præscutal interspaces pale. Pleura dark gray. Halteres pale yellow throughout. Legs with the coxæ and trochanters testaceous yellow; femora obscure yellow basally, passing into dark brown; tibiæ brownish yellow, both ends narrowly darkened; tarsi brownish black. Wings (Plate 1, fig. 16) with a pale-yellow tinge, clearest on prearcular and costal fields; stigma brown, conspicuous; veins brown, yellow in pale areas. Venation: R_2 at or just beyond fork of R_{2+3+4} ; cell M_2 open by atrophy of basal section of vein M_3 ; vein 2d A moderately sinuous.

Abdomen dark brown; hypopygium a trifle brightened. Male hypopygium (Plate 3, fig. 41) with tergite, 9t, a flattened-depressed plate, apical margin gently concave to nearly truncate, surface with microscopic setulæ. Outer dististyle, *od*, blackened, relatively narrow, inner margin produced into a strong black spine; apex produced into a membranous lobe. Inner dististyle, *id*, complex, consisting of an outer flattened black plate that is extended into two, or occasionally, three spinous points; at base of plate a further group of three black spines. Phallosome, *p*, consisting of slender, gently curved, yellow apophyses, acute tips blackened and acute; ædeagus subtended by conspicuous flattened plates.

Habitat.—Northern Korea.

Holotype, male, Ompo, altitude 1,000 feet, May 23, 1938 (Yankovsky). Allotopotype, female. Paratopotypes, 3 females, 1 male, altitude 400 feet, May 19, 1938. Paratype, male, Seren Mountains, altitude 6,000 feet, June 25, 1938 (Yankovsky).

Ormosia (*Ormosia*) *cornutoides* is quite distinct from all other species described from eastern Asia. It is more similar to the western Nearctic *O. (O.) cornuta* (Doane) and *O. (O.) subcornuta* Alexander, yet amply distinct in the structure of the male hypopygium.

ORMOSIA (ORMOSIA) FRAGMENTATA sp. nov. Plate 1, fig. 17; Plate 3, fig. 42.

General coloration dark plumbeous gray, thorax unmarked; halteres pale yellow; legs obscure yellow; wings with a weak brown tinge, large stigma darker brown; R_{2+3} and R_2 subequal, cell R_3 deep; cell M_2 open by atrophy of basal section of M_3 ; male hypopygium with outer dististyle expanded into a triangular blade, truncate outer margin cut into three or four lobes by notches; gonapophyses appearing as slender black rods on either side of an entire depressed median plate.

Male.—Length, about 3.8 to 4 millimeters; wing, 4.5 to 4.7; antennæ, about 1.

Female.—Length, about 5 millimeters; wing, 5.

Rostrum brownish gray; palpi black. Antennæ of moderate length, dark brown; flagellar segments subcylindrical, verticils longer than segments. Head dark gray.

Mesonotum and pleura dark plumbeous gray, without markings. Halteres pale yellow. Legs with coxæ dark brown; trochanters obscure yellow; remainder of legs obscure yellow, terminal tarsal segments darkened. Wings (Plate 1, fig. 17) with a weak brownish tinge, prearcular and costal fields light yellow; stigma large, brown; vague pale-brown washes at cord and along vein Cu ; veins brown, brighter in yellow areas. Macrotrichia of cells abundant but arising from small pale punctures (indicated in figure by stippling). Venation: R_{2+3} and R_2 subequal, both about two-thirds R_{2+3+4} ; cell R_3 deep; cell M_1 deep; cell M_2 open by atrophy of basal section of M_3 ; m-cu erect, at fork of M ; vein 2d A gently sinuous on distal third.

Abdomen dark brown, hypopygium scarcely brightened. Male hypopygium (Plate 3, fig. 42) with the two dististyles nearly terminal. Outer dististyle, *od*, blackened, expanded into a triangular blade, truncated outer margin cut into three or four lobes with fimbriate margins; surface of style with abundant small black setæ. Inner dististyle, *id*, a little larger, outer margin roughened by scabrous points, apex an irregular blade that is fimbriate by irregular teeth. Phallosome, *p*, appearing as simple black apophyses arising laterally from a broadly depressed, yellow, median plate, caudal margin of the latter entire. Ædeagus very slender, narrowed to an acute point.

Habitat.—Northern Korea.

Holotype, male, Ompo, altitude 150 feet, May 8, 1938 (Yankovsky). Allotopotype, female, altitude 400 feet, May 19, 1938.

Paratopotypes, males and females, altitude 150 to 250 feet, May 7 to 13, 1938; altitude 400 feet, May 19, 1938 (*Yankovsky*).

Ormosia (*Ormosia*) *fragmentata* is entirely different from all known regional species of approximately similar general appearance. The structure of the male hypopygium is quite distinctive.

ERIOPTERA (ERIOPTERA) BICORNIFER Alexander.

Erioptera (*Erioptera*) *bicornifer* ALEXANDER, Ann. Ent. Soc. America 14 (1921) 116.

Described from the main island of Japan. Northern Korea, Seren Mountains, altitude 1,500 to 2,000 feet, July 16 to August 27, 1938 (*Yankovsky*).

ERIOPTERA (ERIOPTERA) FUSCOHALTERATA Alexander.

Erioptera (*Erioptera*) *fuscogalterata* ALEXANDER, Proc. U. S. Nat. Mus. Art. 4 68 (1925) 11, 12.

Known hitherto from various stations in eastern Siberia.

Northern Korea, Chonsani, Paiktusan, altitude 3,600 feet, July 13, 1937 (*Yankovsky*). Seren Mountains, altitude 2,800 to 3,000 feet, June 22 to 30, 1938 (*Yankovsky*). The male hypopygium of the unique type was defective in the loss of the outer dististyle and may be redescribed as follows: Outer dististyle appearing as a flattened dark-colored blade that narrows to the obtusely rounded apex. Inner dististyle with apical spine provided with numerous setigerous punctures; on outer margin of style, opposite recurved tip of apical spine, with one or two small spines or strong setigerous tubercles. On what appears to be the ninth tergite, on either side, a microscopic sensory peg.

ERIOPTERA (ERIOPTERA) MEDIOFUSCA sp. nov. Plate 1, fig. 18; Plate 4, fig. 43.

General coloration brown, præscutum darker medially; pleura dark brown, variegated with obscure yellow; knobs of halteres dark brown; femora brown, bases restrictedly yellow; wings subhyaline, with a weak brown tinge, veins pale brown; male hypopygium with outer dististyle a slender blackened rod, tip acute; inner dististyle with tip recurved, blackened; gonapophyses appearing as simple blackened spines.

Male.—Length, about 5 to 6 millimeters; wing, 5 to 7.

Rostrum and palpi black. Antennæ with basal segments brown, outer segments somewhat paler; flagellar segments elongate, subcylindrical; terminal segments shorter than penultimate. Head brownish gray.

Pronotum dark brown medially, yellow on sides; anterior lateral pretergites yellow. Mesonotal præscutum grayish brown, darker brown medially in front, area delimited by row of setigerous punctures on interspaces; scutal lobes darkened; scutellum dark brown; postnotum reddish brown. Pleura chiefly dark brown, variegated with obscure yellow, especially on ventral sternopleurite and dorsopleural membrane. Halteres with stem yellow, outer end and knob dark brown. Legs with coxæ obscure brownish yellow; trochanters yellow; femora brown to dark brown, bases restrictedly yellow; tibiæ and tarsi brownish yellow, terminal tarsal segments dark brown. Wings (Plate 1, fig. 18) subhyaline, with a weak brown tinge; stigmal region vaguely infuscated; veins yellowish brown to pale brown; macrotrichia dark. Venation: vein 2d A strongly sinuous.

Abdomen dark brown, sparsely pruinose; hypopygium reddish yellow. Male hypopygium (Plate 4, fig. 43) with the tergite, 9*t*, lacking a specially modified sensory peg. Outer dististyle, *od*, slender, simple, blackened, tip acute. Inner dististyle, *id*, with tip strongly recurved, blackened; outer margin at near midlength with a small, more or less developed, chitinized point, in cases a small spine. Gonapophyses, *g*, appearing as simple blackened spines.

Habitat.—Northern Korea.

Holotype, male, Seren Mountains, altitude, 2,500 feet, June 18, 1938 (*Yankovsky*). Paratopotypes, 10 males, altitude 2,500 to 6,000 feet, June 14 to 25, 1938 (*Yankovsky*).

Erioptera (*Erioptera*) *mediofusca* has the hypopygium very similar to that of *E. (E.) fuscohalterata* Alexander, but the coloration of the body, legs, and wings is quite different. *E. (E.) lutea* Meigen, of Europe, likewise has a hypopygium of somewhat similar structure, especially the inner dististyle, but the outer dististyle is much broader and of different conformation.

ERIOPTERA (ERIOPTERA) HORII Alexander.

Erioptera (*Erioptera*) *horii* ALEXANDER, Philip. Journ. Sci. 24 (1924) 583, 584.

Widely distributed in northern Japan. Northern Korea, Ompo, altitude 150 feet, June 7, 1937 (*Yankovsky*).

ERIOPTERA (ERIOPTERA) SEX-ACULEATA sp. nov. Plate 1, fig. 19; Plate 4, fig. 44.

General coloration, including antennæ, halteres, and legs, pale yellow; wings yellow, veins poorly differentiated against

ground; male hypopygium with both dististyles simple, outer extended into a long straight black spine; gonapophyses of either side bearing three blackened spinous points, most lateral point larger and microscopically roughened.

Male.—Length, about 5 millimeters; wing, 5.8.

Rostrum yellow; palpi pale brown. Antennæ pale brownish yellow, outer segments even paler; flagellar segments with unusually long pale verticils. Head yellow.

Thorax uniformly pale yellow, unmarked. Halteres yellow throughout. Legs yellow, outer tarsal segments a trifle darker. Wings (Plate 1, fig. 19) pale yellow, veins and macrotrichia a trifle darker than ground. Venation: 2d A unusually sinuous.

Abdomen, including hypopygium, yellow. Male hypopygium (Plate 4, fig. 44) with both dististyles simple, long and slender, outer, *od*, slightly more expanded on basal two-thirds, apex a straight black spine; inner style, *id*, a little shorter, tip narrowly blackened. Gonapophyses, *g*, on either side bearing three spines, most lateral spines larger, blackened apex microscopically roughened; inner spines slenderer, tips conspicuously blackened.

Habitat.—Northern Korea.

Holotype, male, Seren Mountains, altitude 3,500 feet, June 30, 1938 (Yankovsky).

Erioptera (Erioptera) sex-aculeata is quite distinct from the other regional species, especially from all those having the halteres and legs uniformly yellow. The structure of the gonapophyses is quite distinctive of the species.

ERIOPTERA (ILISIA) ASYMMETRICA Alexander.

Erioptera (Acyphona) asymmetrica ALEXANDER, *Canad. Ent.* 45 (1913) 289, 290.

Northern Korea, Seren Mountains, altitude 2,000 to 4,500 feet, August 21 to September 15, 1938 (Yankovsky).

ERIOPTERA (ILISIA) SERENICOLA sp. nov. Plate 1, fig. 20; Plate 4, fig. 45.

General coloration dark gray; halteres pale yellow; femora brownish yellow basally, tips broadly brownish black; tibiæ obscure brownish yellow, both ends more darkened; wings pale yellow, heavily patterned with dark brown; cell 1st M_2 elongate, closed; male hypopygium with outer dististyle deeply divided into two shell-like blades; inner dististyle entirely pale; each gonapophysis blackened, profoundly but unequally bifid.

Male.—Length, about 5 to 5.5 millimeters; wing, 6.5 to 7.

Female.—Length, about 6 to 6.5 millimeters; wing, 7.5 to 8.

Rostrum dark gray; palpi black. Antennæ (male) moderately long, if bent backward extending about to wing root; basal segments pale brownish yellow, outer five or six flagellar segments darker; flagellar segments long-oval. Head dark gray.

Pronotum dark, anterior lateral pretergites obscure yellow. Mesonotal præscutum dark gray, center of præscutum a little darker; pseudosutural foveæ black. Pleura dark gray; dorso-pleural membrane dark brown. Halteres pale yellow. Legs with coxæ gray; trochanters brown; femora brownish yellow basally, tips broadly brownish black, including distal third or more of segment; tibiæ obscure brownish yellow, bases narrowly, tips more broadly blackened; tarsi dark brown to brownish black. Wings (Plate 1, fig. 20) with ground color pale yellow and a relatively heavy dark-brown pattern, including three major costal areas at origin of Rs, stigma and tip of R_{1+2} ; cord and outer end of cell 1st M_2 seamed with brown; a marginal series of spots at ends of all longitudinal veins, largest at R_3 and 2d A; small dark clouds at h, arculus, and fork of M_{3+4} ; a more or less extensive dark seam near midlength of basal section of Cu_1 , in cases including about one-third length of section, in others reduced to small spot; axillary margin in cell 2d A narrowly bordered by dusky; veins yellow, dark brown in clouded areas. Venation: Rs relatively short, only a little longer than R; Sc_2 only a short distance beyond origin of Rs; cell 1st M_2 elongate, closed, much exceeding vein M_{1+2} beyond it; vein 2d A straight.

Abdomen, including hypopygium, black. Male hypopygium (Plate 4, fig. 45) with outer dististyle, *od*, deeply divided into two flattened shell-like blades, outer blade a little larger, yellow, with outer margin blackened, inner blade dusky, more obtuse at apex; a further blackened spinous point midlength of style. Inner dististyle, *id*, entirely pale, expanded at base, constricted at midlength, apex a little expanded. Gonapophyses, *g*, profoundly bifid, heavily blackened, outer arm a nearly straight rod, apical third gently incurved, outer margin microscopically serrulate; inner arm about one-half as long and slenderer, very gently curved, tip with a few denticles.

Habitat.—Northern Korea.

Holotype, male, Seren Mountains, altitude 3,200 feet, June 21, 1938 (*Yankovsky*). Allotopotype, female, pinned with

type. Paratopotypes, several of both sexes, altitude 2,000 to 3,800 feet, June 15 to July 10, 1938 (*Yankovsky*).

Erioptera (*Ilisia*) *serenicola* is very different from all other described species of the genus. In its wing pattern it more resembles species of the subgenus *Hoplolabis* Osten Sacken, but from the venation must be referred to *Ilisia*.

ERIOPTERA (SYMPLECTA) HYBRIDA (Meigen).

Limonia hybrida MEIGEN, Klass. 1 (1804) 57.

Widespread over the entire northern Palæarctic region but not in the Nearctic, as formerly supposed, being there replaced by *E. (S.) cana* (Walker) which ranges as far south as Guatemala and southern Mexico. The following records for *hybrida* greatly extend its recorded range eastward in Asia.

Western China, Kwansien, Szechwan, altitude 4,500 feet, August 4, 1930 (*G. M. Franck*). Northern Japan, Abashiri, Hokkaido, August 31, 1922 (*Teiso Esaki*). Northern Korea, Seren Mountains, altitude 3,500 feet, September 14, 1938 (*Yankovsky*). One male specimen from Korea, on one wing only, has a spur of a vein from 2d A to the margin, thus producing the venation of the subgenus *Podoneura* Bergroth.

I am following Edwards³ in using the name *Symplecta* and in relegating it to subgeneric rank under the older genus *Erioptera*. For many years the subgenus had been called *Helobia* St. Fargeau, but *Symplecta* has now been found to be the prior name.⁴

ERIOPTERA (SYMPLECTA) CHOSENENSIS sp. nov. Plate 1, fig. 21; Plate 4, fig. 46.

General coloration gray; antennæ black throughout; mesonotal præscutum with three narrow dark-brown stripes; scutellum gray, with a narrow brown median vitta; postnotum light gray; pleura brownish gray, variegated with yellow on pteropleurite and caudal portion of sternopleurite; knobs of halteres brownish black; legs black, femoral bases brown; wings pale yellowish subhyaline, spotted with brown; Sc₂ at or beyond one-third length of Rs; m about one-half basal section of M₃;

³Trans. Soc. British Ent. pt. 1 5 (1938) 126.

⁴*Helobia* St. Fargeau, Encycl. Method. Ins. 10 (1828) 585; in the past the date has commonly been given as 1825, in which case it antedated *Helobia* Stephens, Ill. Brit. Ent. Mandibulata (1827) 45, 60, 61, credited by Stephens to Leach. According to Sherborn and others, the actual date of *Helobia* St. Fargeau is 1828, and the name *Symplecta* Meigen must be used, as is done above.

male hypopygium with outer dististyle deeply bifid, arms smooth and blackened; inner dististyle at apex expanded into a small head; gonapophyses smooth, blackened, conspicuously and unequally bispinous at tips.

Male.—Length, about 4.5 to 5 millimeters; wing, 4.5 to 5.

Rostrum and palpi black. Antennæ black throughout, relatively long (male), if bent backward extending nearly to wing root; flagellar segments oval to long-oval. Head light gray; eyes (male) large, anterior vertex narrow.

Pronotum obscure yellow, narrowly dark brown medially. Mesonotal præscutum light brown, humeral and lateral portions yellow; three narrow dark-brown stripes, median stripe nearly complete, lateral pair short, beginning behind transverse black pseudosutural foveæ; scutum brownish gray, each lobe with a dark-brown dash; scutellum light gray, with a narrow brown median vitta; postnotum light gray. Pleura chiefly dark brownish gray, variegated with yellow, including most of pteropleurite and a confluent spot at caudal portion of sternopleurite; dorsopleural membrane dusky. Halteres with stem yellow, knob brownish black. Legs with coxæ brownish yellow; trochanters obscure yellow; femora brown, tips passing into black; tibiæ and tarsi black. Wings (Plate 1, fig. 21) pale yellowish subhyaline; prearcular and costal areas somewhat clearer yellow; a restricted brown pattern, including areas at origin of R_s , Sc_2 , cord, outer end of cell 1st M_2 , tip of R_{1+2} , and at supernumerary crossvein in cell R_3 ; smaller and somewhat paler brown areas at end of vein R_3 , at midlength and near tip of 2d A, at margin of midlength of cell 2d A, and postarcular in base of cell M; veins pale brown, darker in clouded areas. Venation: Sc_2 some distance beyond origin of R_s , at or beyond one-third length of vein; supernumerary crossvein in cell R_3 opposite tip of vein R_{1+2} ; m about one-half basal section of M_3 ; m-cu oblique, about two-thirds its length before fork of M; vein 2d A moderately sinuous.

Abdominal tergites dark brown, sternites somewhat more pruinose, lateral borders restrictedly yellow; hypopygium more yellowish. Male hypopygium (Plate 4, fig. 46) without terminal lobes on basistyle, *b*. Outer dististyle, *od*, deeply bifid, arms smooth and blackened; outer arm a little stouter than inner, especially on basal portion. Inner dististyle, *id*, weakly darkened, at apex expanded into a small head. Gonapophyses, *g*, smooth, blackened, conspicuously bispinous at tips, outer spine much longer than inner or lower one.

Habitat.—Northern Korea.

Holotype, male, Seren Mountains, altitude 3,000 feet, July 16, 1938 (Yankovsky). Paratopotypes, males and females, altitude 5,000 feet, September 14, 1938 (Yankovsky).

Erioptera (*Symplecta*) *chosenensis* is very different from all known species of the subgenus, especially in the structure of the male hypopygium. Insofar as can be judged from a comparison of different sexes only it is apparently closest to *E. (S.) scotica* Edwards, still known only from females taken in Scotland. This latter fly differs in various details of coloration and venation, especially the pattern of the scutellum, and in the distal position of Sc_2 , with the dark areas at origin of R_s and on Sc_2 entirely separate.

ERIOPTERA (EMPEDA) SUBNUBILA sp. nov. Plate 1, fig. 22; Plate 4, fig. 47.

General coloration clear light gray; palpi and antennæ black; halteres pale yellow; legs brown, without scales; wings whitish subhyaline, stigma very slightly darker; veins pale; male hypopygium with outer dististyle bifid, stem fully as long as outer branch; both branches sclerotized and somewhat blackened, outer branch bispinous at tip; inner dististyle with apex less pointed than in *cinerascens*.

Male.—Length, about 4 millimeters; wing, 4.5.

Rostrum dark gray; palpi black. Antennæ black. Head light gray.

Pronotum gray; lateral pretergites light yellow. Mesonotum clear light gray, præscutal interpaces differentiated by a slightly more brownish line and by a series of long erect setæ; pseudosutural foveæ linear, black. Pleura gray, including dorsopleural membrane. Halteres pale yellow, knob large. Legs with coxæ testaceous brown, sparsely pruinose; trochanters yellow; remainder of legs brown, terminal tarsal segments more brownish black; legs without scales. Wings (Plate 1, fig. 22) whitish subhyaline, stigma very slightly darker; prearcular and costal regions somewhat more whitened; veins pale brown. Venation: Vein R_3 slightly more arcuated and less oblique than in *cinerascens*; cell M_3 shallower.

Abdomen dark brown, sparsely pruinose; hypopygium a little brightened. Male hypopygium (Plate 4, fig. 47) with the outer dististyle, *od*, bifid, fused basal portion or stem fully as long as outer branch; both branches sclerotized and somewhat blackened; outer branch dilated on basal two-thirds, tip bispinous, before apex with a lateral rounded shoulder. In *cinerascens* all

dististyles are pale, outer branch very short, trispinous at apex. Inner dististyle, *id*, narrower than in *cinerascens*, apex less pointed.

Habitat.—Northern Korea.

Holotype, male, Seren Mountains, altitude 3,000 feet, June 17, 1938 (Yankovsky).

Erioptera (*Empeda*) *subnubila* is closest to the European *E. (E.) cinerascens* Meigen (*nubila* Schummel). It is most readily told by the structure of the male hypopygium. Edwards⁵ considers *Empeda* Osten Sacken and *Gonempeda* Alexander as representing subgenera of the genus *Cheilotrichia* Rossi. I still believe all three represent subgeneric groups in the major genus *Erioptera* Meigen.

MOLOPHILUS (MOLOPHILUS) TRIACANTHUS Alexander.

Molophilus triacanthus ALEXANDER, Philip. Journ. Sci. 53 (1934) 294, 295.

Formerly known only from the mountains of Honshiu, Japan.

Northern Korea, Ompo, altitude 200 to 800 feet, May 8 to 29, 1938 (Yankovsky).

MOLOPHILUS (MOLOPHILUS) MONACANTHUS sp. nov. Plate 1, fig. 23; Plate 4, fig. 48.

Belongs to the *Gracilis* group and subgroup; general coloration black; femora black with about basal third yellow; tibiae obscure yellow, bases and tips darkened; wings with a strong brownish tinge, prearcular and costal portions clearer yellow; male hypopygium with ventromesal lobe of basistyle extensive, produced into a group of short spinous points; outer dististyle a little expanded at apex; phallosomic structure at apex produced into a long straight spine.

Male.—Length, about 4.5 millimeters; wing, 4.8 to 5; antennæ, about 1.

Female.—Length, about 5 millimeters; wing, 5.

Rostrum and palpi black. Antennæ short, dark brown throughout; flagellar segments oval, longest verticils unilaterally arranged and much exceeding segments. Head gray.

Pronotum black, pretergites restrictedly but conspicuously pale yellow. Mesonotum black, very sparsely pruinose to produce a slightly opaque appearance. Pleura dull black, dorsopleural membrane dark brown. Halteres pale yellow, only base of stem weakly infumed. Legs with coxæ and trochanters

⁵ Trans. Soc. British Ent. pt. 1 5 (1938) 119.

black; femora black, bases yellow, including about proximal third; tibiæ obscure yellow, extreme base and wider tip infuscated; tarsi dark brown. Wings (Plate 1, fig. 23) with a strong brown tinge, prearcular and costal fields light yellow; veins and trichia darker brown. Venation: R_2 lying shortly distad of r-m; petiole of cell M_3 approximately three times m-cu; vein 2d A long, ending a short distance beyond m-cu.

Abdomen, including hypopygium, black. Male hypopygium (Plate 4, fig. 48) with dorsal lobe of basistyle short, terminating in a small acute point; ventromesal lobe, *vb*, much broader, inner mesal portion produced into a number of spinous points, including a larger triangular black tooth slightly more basad in position. Outer dististyle, *od*, a nearly straight rod, at apex a little expanded and produced laterad into a point. Inner dististyle, *id*, little shorter, appearing as a slender, nearly straight spine from a slightly expanded base, surface with numerous setæ. Phallosome, *p*, an oval plate, apex produced into a single long, straight, black spine; surface of expanded basal portion with abundant close-set setigerous tubercles to produce a somewhat squamose appearance. Ædeagus, *a*, pale yellow, provided with expanded flanges.

Habitat.—Northern Korea.

Holotype, male, Seren Mountains, altitude 2,800 feet, July 5, 1938 (Yankovsky). Allotopotype, female. Paratopotypes, males and females, altitude 1,800 to 3,800 feet, June 10 to July 10, 1938; paratypes, males and females, Ompo, altitude 700 to 1,000 feet, May 23, 1938 (Yankovsky).

Molophilus (*Molophilus*) *monacanthus* is quite distinct from all other regional black species, differing especially in the structure of the male hypopygium, notably the unispinous phallosomic structure. In its general appearance it is amazingly like the species next considered, *M. (M.) facinus* sp. nov., but the structure of the hypopygium is entirely distinct.

MOLOPHILUS (MOLOPHILUS) FACINUS sp. nov. Plate 4, fig. 49.

Belongs to the *gracilis* group and subgroup; general coloration black, including head, thorax, and abdomen; halteres yellow; femora yellow basally, tips broadly brownish black, widest on fore femora; tibiæ yellow, with both ends narrowly darkened; wings brownish gray, prearcular and costal portions pale yellow; R_s very long; male hypopygium with basistyle terminating in three lobes, mesal lobe longest; two

simple dististyles, outer one nearly straight, its distal half with microscopic spinulæ; inner dististyle a sinuous blackened horn that is extended into a long slender point; phallosomic plate depressed-flattened, apex obtuse, surface with scattered microscopic setulæ.

Male.—Length, about 4 millimeters; wing, 4.5; antennæ, about 1.

Female.—Length, about 5 millimeters; wing, 5.

Rostrum and palpi black. Antennæ with scape and pedicel black, flagellum paler, brownish yellow to brown, outer segments darker; flagellar segments oval, with long verticils. Head black.

Thorax black, surface of præscutum subnitidous. Halteres very pale yellow. Legs with coxæ brownish black to black; trochanters obscure yellow; femora yellow basally, tips broadly brownish black, including about distal half of fore femora and approximately three-fourths of posterior pair; tibiæ light yellow, with each end narrowly darkened; basitarsi brownish yellow, remainder of tarsi black. Wings brownish gray, pre-arcular and costal portions restrictedly pale yellow; veins pale brown, macrotrichia darker. A few scattered setigerous punctures at base of cell R between arculus and origin of Rs. Venation: Rs very long, R correspondingly reduced; R₂ about in transverse alignment with r-m; petiole of cell M₃ nearly four times m-cu; vein 2d A long, gently sinuous.

Abdomen black. Male hypopygium (Plate 4, fig. 49) with basistyle terminating in three lobes, dorsal, *db*, shortest, obtuse and unblackened at apex, provided with setæ to tip; ventral lobe, *vb*, a little longer and stouter, tip obtuse; mesal lobe, *mb*, longest, heavily blackened, terminating in a blackened blade, margin before apex with a small lateral lobe or obtuse spine. Two dististyles, outer, *od*, a slender, nearly straight rod, basal half slightly more dilated but glabrous, distal half narrowed, terminating in an acute spine, surface back from tip with numerous appressed spinulæ. Inner dististyle, *id*, a sinuous blackened horn that narrows to a long, attenuate, acute point. Phallosomic structure a flattened plate, apex obtusely rounded, unarmed, surface with very delicate scattered setulæ. Ædeagus long, relatively slender.

Habitat.—Northern Korea.

Holotype, male, Ompo, altitude 1,000 feet, May 23, 1938 (*Yankovsky*). Allotopotype, female. Paratopotypes, several of

both sexes, altitude 300 to 1,000 feet, May 19 to June 16, 1938 (Yankovsky).

In the structure of the male hypopygium *Molophilus* (*Molophilus*) *facinus* is very different from the other regional species that have the body coloration intensely black. As indicated under the preceding species, it is very similar to the latter, *M.* (*M.*) *monacanthus* sp. nov., yet very distinct.

MOLOPHILUS (MOLOPHILUS) AVIDUS sp. nov. Plate 1, fig. 24; Plate 4, fig. 50.

Belongs to the *gracilis* group and subgroup; general coloration plumbeous; antennæ short, basal segments obscure yellow, outer segments passing into brown; halteres yellow; legs pale yellowish brown, outer segments darker; wings subhyaline, veins a little darker than ground; male hypopygium with dorsal lobe of basistyle produced into two conspicuous curved spines; ventral lobe a small, pale, fingerlike structure; two simple dististyles, longest with appressed spinulæ on distal half; phallosomic plate pale, apex obtusely rounded, surface with abundant microscopic setulæ.

Male.—Length, about 4 millimeters; wing, 4.4 to 4.5.

Female.—Length, about 5 millimeters; wing, 5.4.

Rostrum and palpi brown. Antennæ (male) short, if bent backward not attaining wing root; basal segments obscure yellow, outer segments passing into brown. Head dark gray.

Pronotum brown, obscure yellow behind; anterior lateral pretergites yellow. Mesonotum almost uniformly grayish brown to plumbeous; scutellum obscure brownish yellow to testaceous; postnotum paler brown. Pleura pale brown, dorsal pleurites a little darker. Halteres yellow. Legs with the coxæ and trochanters obscure yellow; remainder of legs pale yellowish brown, terminal tarsal segments dark brown to brownish black. Wings (Plate 1, fig. 24) subhyaline, veins a little darker than ground; costal fringe dark brown, long and dense. Venation: R_2 lying distad of level of r-m; m-cu about one-fourth length of petiole of cell M_3 ; vein 2d A long, gently sinuous.

Abdomen brown, including hypopygium. Male hypopygium (Plate 4, fig. 50) with dorsal lobe of basistyle, *db*, produced into two spines, the outer a conspicuous curved spinous blade, with nearly the apical half prolonged mesad into a straight blackened spine; inner spine of lobe broad-based, terminating in a long slender point; ventral lobe of basistyle, *vb*, proximal in position, unusually slender and entirely pale. Dististyles,

outer, *od*, longest, appearing as a powerful, curved, blackened rod from an expanded base, distal half with appressed spinules, tip acute; inner style, *id*, sinuous, distal half with small punctures. Phallosomic plate, *p*, pale, apex obtusely rounded; surface with abundant microscopic setulæ.

Habitat.—Northern Korea.

Holotype, male, Seren Mountains, altitude 2,500 feet, June 17, 1938 (*Yankovsky*). Allotopotype, female, pinned with type. Paratopotypes, 1 male, 1 female, with types; 1 male, altitude 1,800 feet, June 26, 1938 (*Yankovsky*).

Molophilus (*Molophilus*) *avidus* is quite distinct from all other regional species of the genus, differing primarily in the structure of the male hypopygium, notably the bispinous dorsal lobe of the basistyle.

ILLUSTRATIONS

[Legend: *a*, aedeagus; *b*, basistyle; *d*, dististyle; *db*, dorsal lobe of basistyle; *dd*, dorsal dististyle; *g*, gonapophysis; *id*, inner dististyle; *mb*, mesal lobe of basistyle; *od*, outer dististyle; *p*, phallosome; *t*, tergite; *vb*, ventral lobe of basistyle; *vd*, ventral dististyle.]

PLATE 1

- FIG. 1. *Limonia* (*Limonia*) *parvipennis* sp. nov.; venation.
 2. *Limonia* (*Dicranomyia*) *parviloba* sp. nov.; venation.
 3. *Antocha* (*Antocha*) *integra* sp. nov.; venation.
 4. *Dicranota* (*Eudicranota*) *perdistincta* sp. nov.; venation.
 5. *Limnophila* (*Elæophila*) *persalsa* sp. nov.; venation.
 6. *Limnophila* (*Elæophila*) *serenensis* sp. nov.; venation.
 7. *Limnophila* (*Adelphomyia*) *macrotrichiata* Alexander; venation.
 8. *Limnophila* *yankovskyana* sp. nov.; venation.
 9. *Rhabdomastix* (*Sacandaga*) *spatulifera* sp. nov.; venation.
 10. *Rhabdomastix* (*Sacandaga*) *luridoides* sp. nov.; venation.
 11. *Cryptolabis* (*Bæoura*) *septentrionalis* sp. nov.; venation.
 12. *Ormosia* (*Ormosia*) *devota* sp. nov.; venation.
 13. *Ormosia* (*Ormosia*) *cata* sp. nov.; venation.
 14. *Ormosia* (*Ormosia*) *prava* sp. nov.; venation.
 15. *Ormosia* (*Ormosia*) *yankovskyi* sp. nov.; venation.
 16. *Ormosia* (*Ormosia*) *cornutoides* sp. nov.; venation.
 17. *Ormosia* (*Ormosia*) *fragmentata* sp. nov.; venation.
 18. *Erioptera* (*Erioptera*) *mediofusca* sp. nov.; venation.
 19. *Erioptera* (*Erioptera*) *sex-aculeata* sp. nov.; venation.
 20. *Erioptera* (*Ilisia*) *serenicola* sp. nov.; venation.
 21. *Erioptera* (*Symplecta*) *chosenensis* sp. nov.; venation.
 22. *Erioptera* (*Empeda*) *subnubila* sp. nov.; venation.
 23. *Molophilus* (*Molophilus*) *monacanthus* sp. nov.; venation.
 24. *Molophilus* (*Molophilus*) *avidus* sp. nov.; venation.

PLATE 2

- FIG. 25. *Limonia* (*Limonia*) *parvipennis* sp. nov.; male hypopygium.
 26. *Limonia* (*Dicranomyia*) *parviloba* sp. nov.; male hypopygium.
 27. *Limonia* (*Dicranomyia*) *parviloba parvincisa* subsp. nov.; male hypopygium.
 28. *Antocha* (*Antocha*) *integra* sp. nov.; male hypopygium.
 29. *Dicranota* (*Eudicranota*) *perdistincta* sp. nov.; male hypopygium.
 30. *Limnophila* (*Elæophila*) *persalsa* sp. nov.; male hypopygium.
 31. *Limnophila* (*Elæophila*) *serenensis* sp. nov.; male hypopygium.
 32. *Limnophila* *yankovskyana* sp. nov.; male hypopygium.

PLATE 3

- FIG. 33. *Rhabdomastix* (*Sacandaga*) *nigroapicata* sp. nov.; male hypopygium.

- FIG. 34. *Rhabdomastix* (*Sacandaga*) *spatulifera* sp. nov.; male hypopygium.
35. *Rhabdomastix* (*Sacandaga*) *luridoides* sp. nov.; male hypopygium.
36. *Cryptolabis* (*Bæoura*) *septentrionalis* sp. nov.; male hypopygium.
37. *Ormosia* (*Ormosia*) *devota* sp. nov.; male hypopygium.
38. *Ormosia* (*Ormosia*) *cata* sp. nov.; male hypopygium.
39. *Ormosia* (*Ormosia*) *prava* sp. nov.; male hypopygium.
40. *Ormosia* (*Ormosia*) *yankovskyi* sp. nov.; male hypopygium.
41. *Ormosia* (*Ormosia*) *cornutoides* sp. nov.; male hypopygium.
42. *Ormosia* (*Ormosia*) *fragmentata* sp. nov.; male hypopygium.

PLATE 4

- FIG. 43. *Erioptera* (*Erioptera*) *mediofusca* sp. nov.; male hypopygium.
44. *Erioptera* (*Erioptera*) *sex-aculeata* sp. nov.; male hypopygium.
45. *Erioptera* (*Ilisia*) *serenicola* sp. nov.; male hypopygium.
46. *Erioptera* (*Symplecta*) *chosenensis* sp. nov.; male hypopygium.
47. *Erioptera* (*Empeda*) *subnubila* sp. nov.; male hypopygium.
48. *Molophilus* (*Molophilus*) *monacanthus* sp. nov.; male hypopygium.
49. *Molophilus* (*Molophilus*) *facinus* sp. nov.; male hypopygium.
50. *Molophilus* (*Molophilus*) *avidus* sp. nov.; male hypopygium.

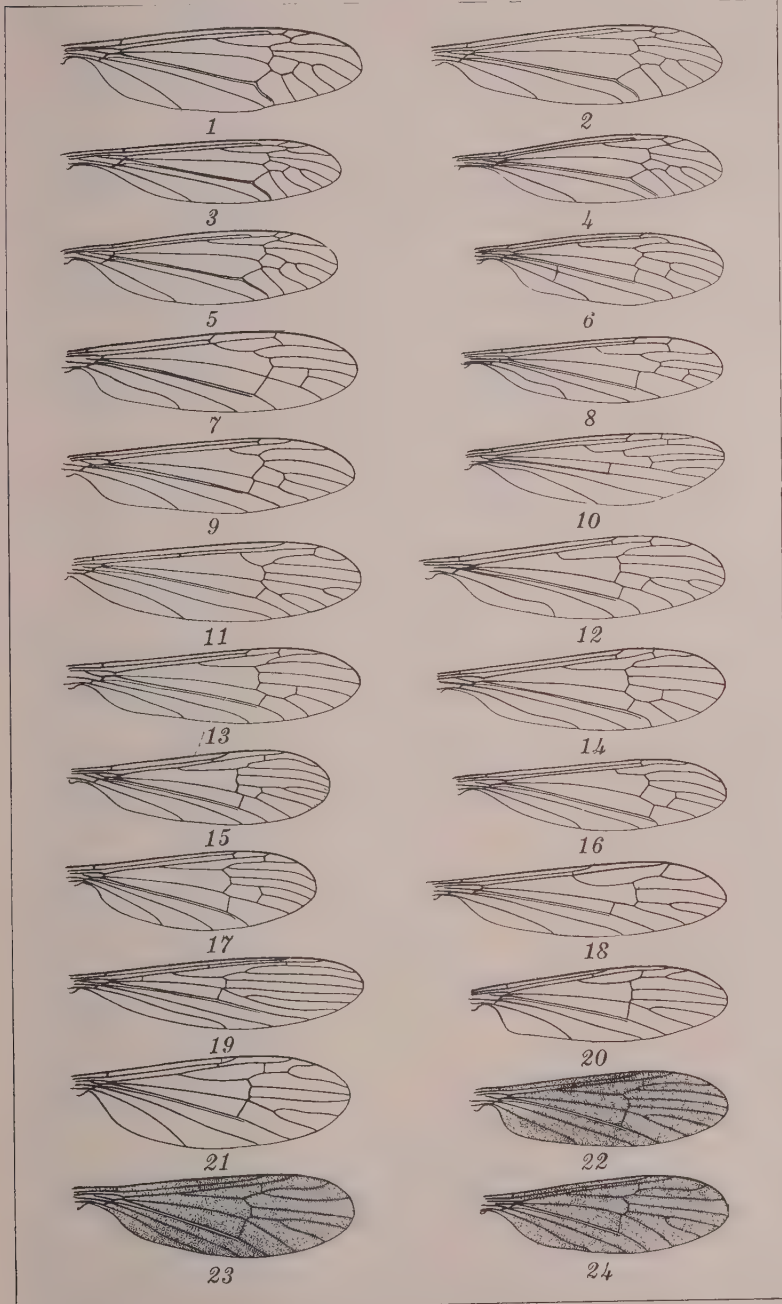


PLATE 1.

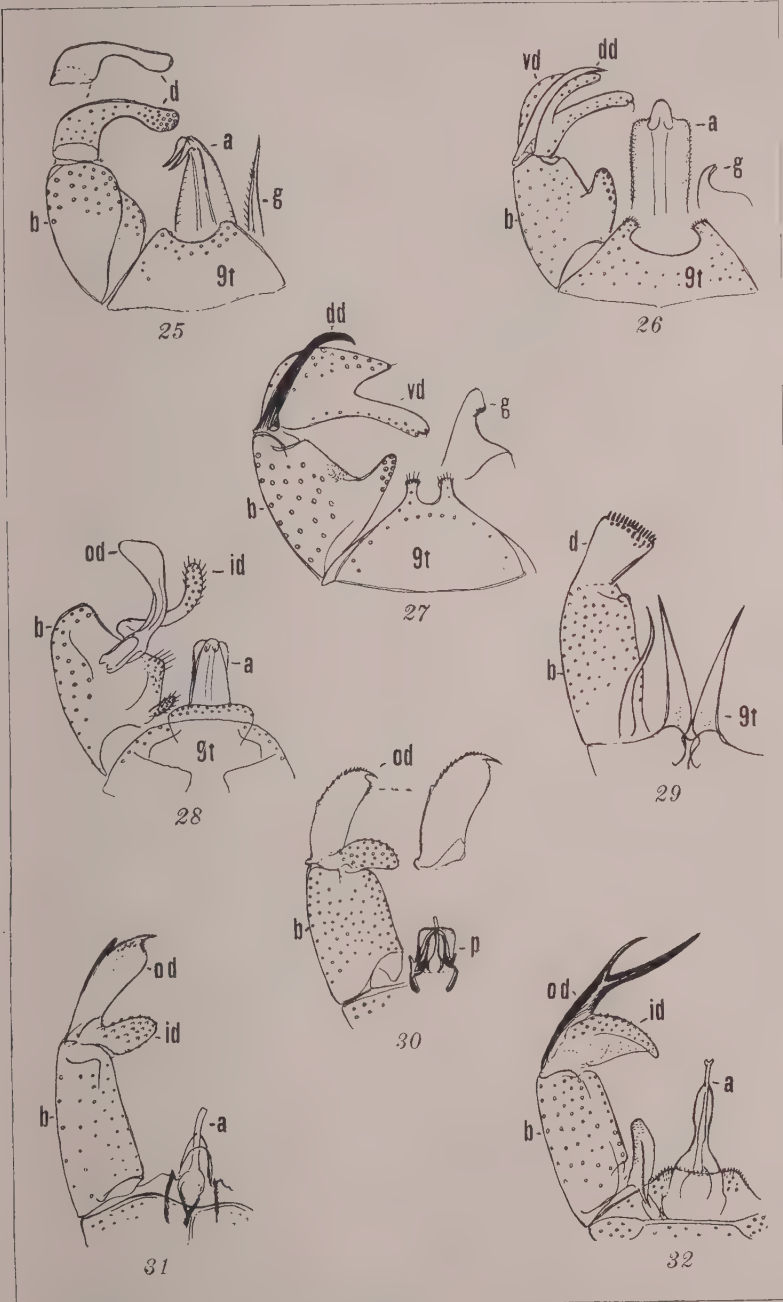


PLATE 2.

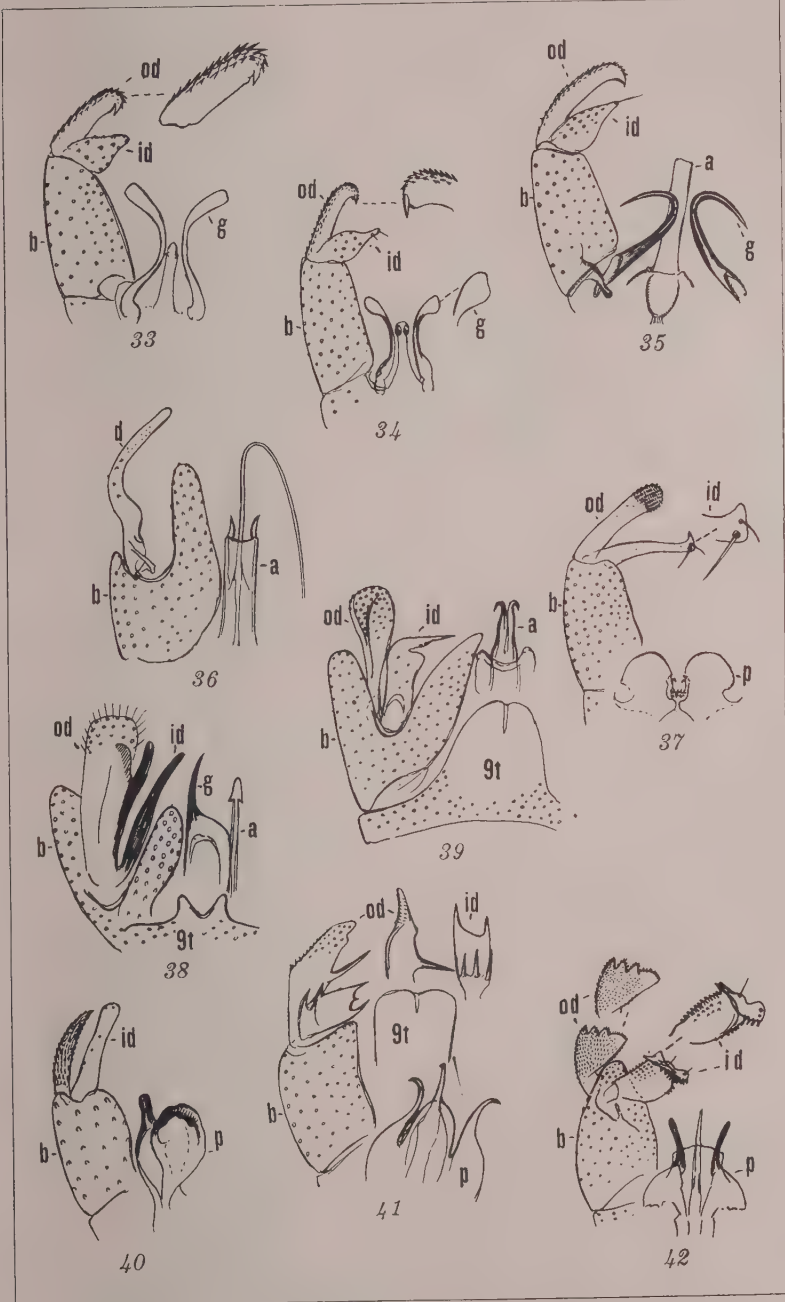


PLATE 3.

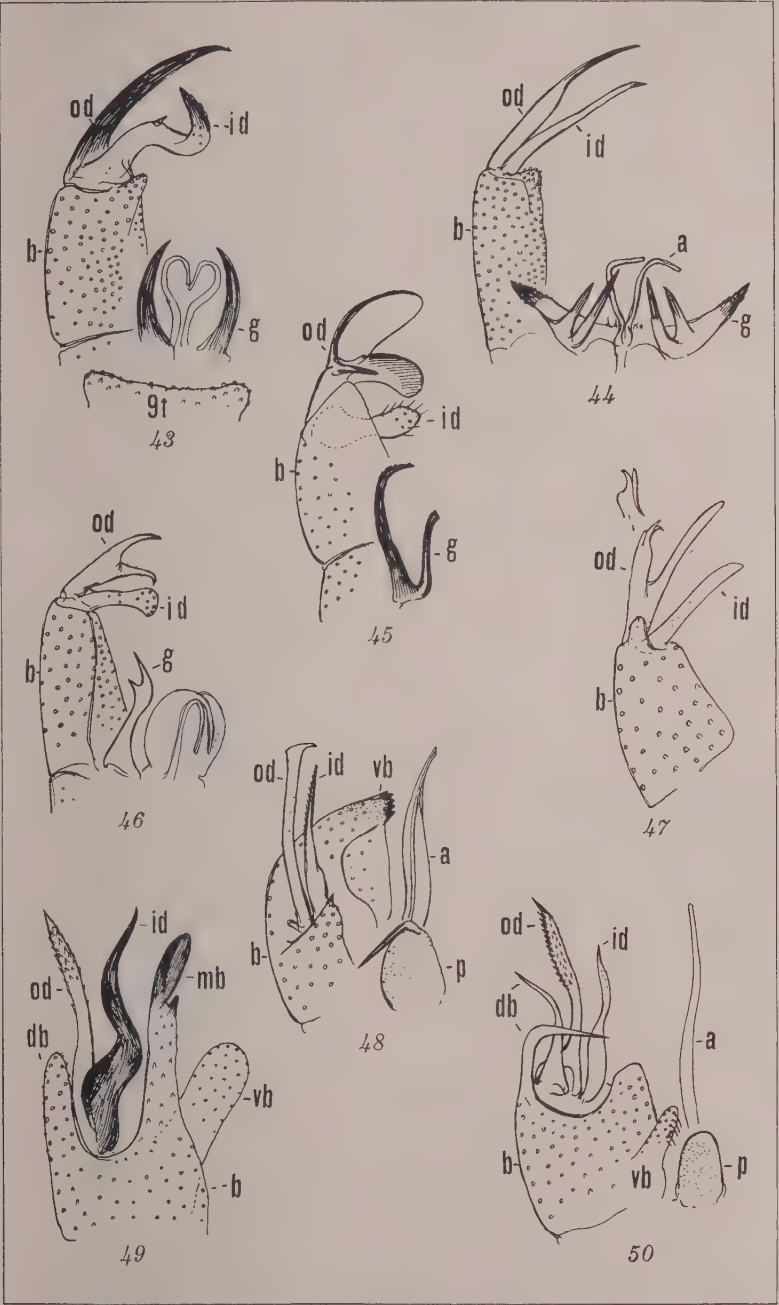


PLATE 4.

A NEW FISH FROM LINGAYEN GULF, PHILIPPINES

By HILARIO A. ROXAS and GUILLERMO L. ABLAN

*Of the Division of Fisheries, Department of Agriculture and Commerce
Manila*

ONE PLATE

Genus GNATHOLEPIS Bleeker (1874)

Body elongate, compressed, covered with 24 to 32 ctenoid scales, more cycloid but large on neck. Head compressed, scaled above after eyes and on preoperculum and operculum with large cycloid scales. Eyes large, in anterior half of head. Bony interorbital narrow. Snout short. Anterior nostril in a short tube. Mouth oblique, upper or lower jaw prominent. Teeth in rows, outer row enlarged, sometimes last teeth caninoid in lower jaw. Tongue truncate to scarcely bilobate. Gill openings not far continued forward below, isthmus narrow. Inner edge of shoulder girdle without fleshy flaps. Dorsal fins separate, first dorsal with 6 spines, second dorsal with 9 to 12 rays, anal with 9 to 12 rays, ventral united, oblong, under pectoral. Pectoral without free silklike rays. Caudal obtuse to rounded.

Herre (1927) found in some Philippine species of the genus, as deviations from those of Bleeker's description, notched tongue and pointed caudal.

In this paper is described one species of the genus which is very distinct from those so far described.

GNATHOLEPIS TURNERI sp. nov. Plate 1.

First dorsal VI; second dorsal I, 10; anal I, 10; 28 scales in longitudinal series, 8 in transverse series, 14 before first dorsal.

Body elongate; dorsal outline straight; ventral outline convex, compressed posteriorly from anal papilla, greatest depth 6, head 3.64 in standard length; snout blunt and rounded, 5 in head; eyes large, about equal snout, placed very high, dorsolateral, close together, only a narrow ridged bony interorbital separating the two; mouth oblique, jaws equal, posterior angle of maxillary in line with front margin of eye; teeth in several rows in each jaw, those of outer row enlarged, curved, exposed; tongue strongly notched; the whole fish covered with large thin scales,

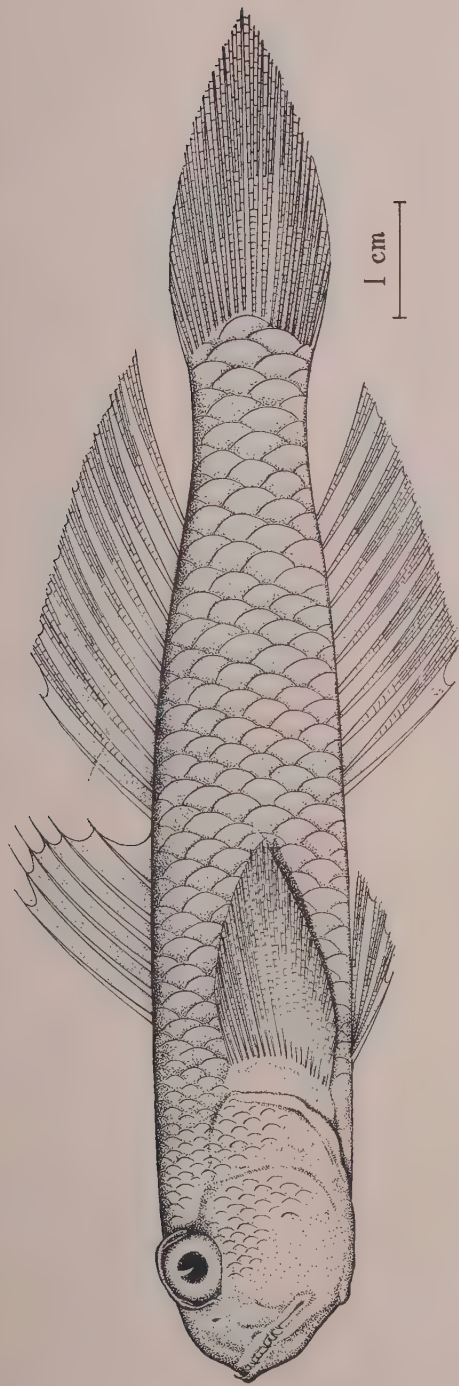


PLATE 1. GNATHOLEPIS TURNERI SP. NOV.

THE FISHERY INDUSTRIES OF ZAMBOANGA

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SIX PLATES AND SEVEN TEXT FIGURES

Zamboanga Province, including the recently chartered City of Zamboanga, has an area of 6,383 square miles. It occupies the entire peninsula projecting west of Pangil Bay to the south, including the island of Basilan, Olutanga, and some 150 smaller islets. It is bounded on the east by Occidental Misamis Province, Pangil Bay, and Lanao Province; on the south by Celebes Sea; and on the north and west by the Sulu Sea. It has several bays, the largest being Sibuguey Bay, Dumanquilas Bay, Pagadian Bay, and Sindangan Bay. Some of the smaller bays are Maligay Bay, Igat Bay, Port Sibulan, Tumulung Bay, Locsico Bay, Taba Bay, Busan Bay, Port Bañga, Tuñgan Bay, Taguete Bay, Caldera Bay, Sibuco Bay, Panabutan Bay, Siokon Bay, Port Santa Maria, Coronado Bay, and several others. In Basilan Island are Takut Tangu Bay, Look Sambang Bay, San Rafael Bay, and Maluso Bay. The entire coastline of Zamboanga Province is approximately 700 miles. All along the coast are shoals and extensive coral reefs and sandy and partly muddy shores.

The population of the province and of the City of Zamboanga is a mixture of Christian and non-Christian peoples, with the former slightly in the majority. The Christians, including foreigners, number 161,184, and the non-Christians, 106,829. All the non-Christians are fish-eating peoples, and the same is true of the majority of the Christian population. Roughly, over 90 per cent of the entire population of Zamboanga depends on fish as the principal protein in their diet.

The Port of Zamboanga serves as a distributing center of fish and other marine commercial products to different parts of the Archipelago. The physical condition and geographical location of the port, together with the type of people inhabiting

the region, make fishing an important industry in the locality. Getting a food fish supply is therefore no problem in any part of Zamboanga Province.

PRINCIPAL FISHING GROUNDS

Practically all waters around the province and the City of Zamboanga are rich fishing grounds with a great variety of fishes. The shoals, bays, coves, and mouths of rivers are rich shallow-fishing grounds. Off-shore areas are rich in different pelagic and demersal fishes.

The principal shallow-fishing grounds are around Dumanquilas Bay, Igat Bay, Port Sibulan, Tumalung Bay, Locsico Bay, the whole Masinloc Anchorage including the neighborhood of Sacol and Tictauan Island, Caldera Bay, Sibuco Bay, Panabutan Bay, Port Santa Maria, Sindanga Bay, Dipolog Shoal, and Dapitan Bay. At Basilan Island the principal fishing grounds are around Takut Tangu Bay, in the neighborhood of Bohelabong, Kauluan Island, the mouth of Kandiiis River, and around Kapago up to Matanal point; Look Sambang Bay in the neighborhood of the mouth of Gubauan River; around San Rafael Bay in the neighborhood of Gumalarang River, Balatana Island up to Lampinigan Island; and Maluso Bay in the neighborhood of Maluso and Canabuñgan Rivers and including the surroundings of the Gounan Islets, Takela, and Goren Islands, and many other places in the neighborhood.

The offshore sea fishing grounds are rich in all species of game and commercial fishes, like the yellowfin tuna, *Neothunnus macropterus*; the skipjack or ocean bonito, *Katsuwonus pelamis*; the frigate mackerel, *Auxis thazard*; the bonito, *Euthynnus yaito*; the Spanish mackerel, *Cybium commerson*; the barracuda, *Sphyræna aureo-flammea*; the runner, *Elagatis bipinnulatus*; and the carangoid, *Caranx* spp. (tarakitok). Other fishing grounds are Sibuguey Bay, Sulu Sea, Moro Gulf, and Celebes Sea. In Sibuguey Bay the best tuna-fishing grounds are around Olutanga Island and in the neighborhood of Angosto Shoal; in Sulu Sea, around Zamboanga Peninsula, is a good tuna fishing ground, particularly in the neighborhood of Sangboy Island; and in Moro Gulf and Celebes Sea. The whole neighborhood of Basilan Island is a good tuna-fishing ground.

FISHING GEAR, CRAFT, AND METHODS OF FISHING

With the exception of the modern fishing boats used for tuna fishing in deeper waters by the Sea Foods Corporation, the equipment and gear used in the fisheries of Zamboanga are of primitive type, apparently used for the last century. Though usually home-made, they are well constructed and suited to meet local conditions. The most common craft is the banca, locally called *vinta*, which is a paddled or sailing dugout usually equipped with two outriggers. It is seaworthy and capable of considerable speed when the sail is used. It is always equipped with the most primitive implements of fishing, like the spear, a larger hooklike implement attached to a long, light pole that is detachable and tied by a strong cord. This spear also serves as a hook for catching large fishes and sharks. The three-tooth prong, called "salapang," with a long handle, is also commonly used by the Moro fishermen. A hook and line are almost always part of the fishing equipment. A "barroto" is usually a bigger dugout, used in connection with the more modern type of fishing nets, the "chinchorro" and "baling."

FISH TRAPS

Fish corral.—The fish corral is the most common fishing apparatus used and is always found on sheltered coastlines and shoals. It is locally known as *bunsod*. Except in a few cases the *bunsod* is of one type and style. It is a partly modified *pahubas* type. It is a temporary bamboo corral, set on flats or gradually sloping shores to catch fish frequenting the intertidal zones. It varies in size from a small to a large inclosure, covering several hundred square meters in area. It usually consists of three heart-shaped compartments; the *bunuan*, the *sagaran*, and the *kaluagan*, with two wings called *pikpik* and a leader called *pamansan*. Text fig. 1 is a diagram of this common and typical *bunsod*.

Except for those constructed around Takut Tangug Bay in the neighborhood of Bohelebong and Kauluan Island, *bunsod* are constructed out of temporary materials, usually supported by small wooden piles with bamboo matting (*sigid*), tied together by small strips of rattan or vine *diliman*. It is said that the vine lasts longer than the rattan in sea water. In the neighborhood of Bohelebong and Kauluan Island, around Takut Tangug Bay, most of the *bunsods* are constructed with

large *pagatpat* wooden piles, with the usual bamboo matting tied together by rattan. The large wooden piles or posts are said to last as long as ten years, so that only the bamboo mattings

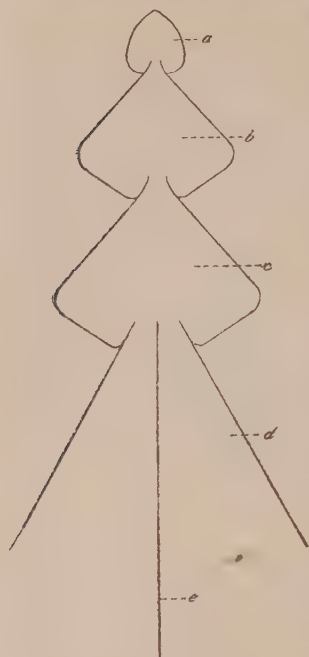


FIG. 1. Bunsod fish corral, a, bunuan; b, sagaran; c, kaluagan; d, pikpik; e, pamansan.

need to be reinforced when they are damaged. Most of these fish corrals are constructed in waters from 4 to 10 meters deep and are of different shapes and styles. The bunsod catches many different kinds of large fishes, like the ocean bonito (*Katsuwonus pelamis*), bonito (*Euthynnus yaito*), Spanish mackerel (*Cybius commerson*), carangoids (*Caranx* spp.), runner (*Elagatis bipinnulatus*) and others. It is claimed that some fish corrals catch from 500 to 10,000 tuna fish at one time. The difference in the plan and shape of these bunsods in this region depends on their location and relation to the different islets, shoals, and fish corrals found within the bay. In spite of the strong materials used and the depth where they are constructed it is said that

in most cases the cost of construction is less than 100 pesos.¹ Text fig. 2 shows diagrams of the different

shapes and plans of bunsods in this locality.

In all cases the three compartments are always present, though differently arranged in the typical order. In some cases the pikpik are absent and a part of the walls of the kaluagan serves their purpose; in other cases the pamansan is absent. Still in others both pikpik and pamansan are absent.

In all of these fish corrals the fishes are usually impounded either in the bunuan or in the sagaran. The fishes are caught by the use of siguid, with the help of a large bamboo basket raised up after the fishes are all driven into it. In some bunsods a small net, called *pukot* or *rede*, is used to gather the fishes from the kaluagan.

Another form of fish corral found in Dipolog and neighboring places is the *paugmad*, similar to the *linati*. It is of

¹ One peso equals 50 cents United States currency.

the simplest type, usually constructed in waters from 8 to 10 fathoms deep. It has the form of an anchor, and, excluding the leader, is crescent-shaped. It occupies an area of about half a hectare, usually constructed of and supported by long and large bamboo poles. Similar materials are placed at right angles to these supports tied together with rattan. Some of the fish

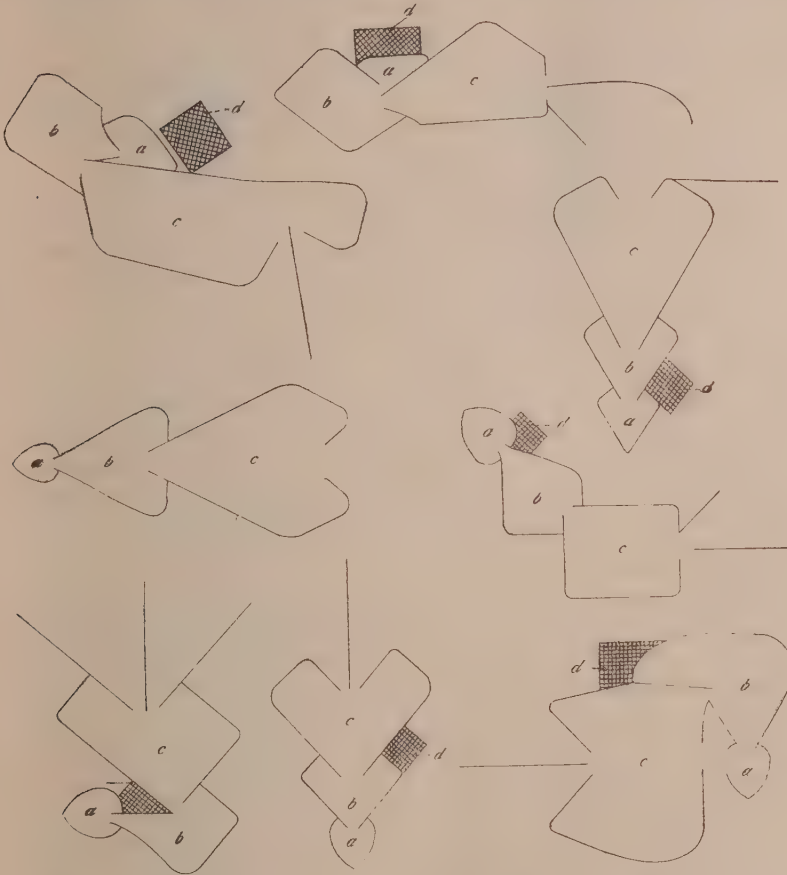


FIG. 2. Variations of the bunsod. a, bunuan; b, sagaran; c, kaluagan; d, hut.

corrals are reinforced with a few coconut trunks. Along the sides are coarsely woven bamboo lattices of about 4-inch mesh, tied to the supports and framework with strips of rattan. At the two ends of the paugmad are bamboo platforms used for spreading and drying the net, called *sign*. At the vertex of the anchorlike enclosure or at the side of one arm is usually a

small hut where the fishermen may watch for the entrance of large fishes to haul them in before they have a chance to escape. A few meters from the surface of the water, along the entire wall of the fish corral, are side platforms made of one or two large bamboos from where the fishermen drag the *sigin* during actual hauling of the net. From the middle of the gate a series of bamboo piles extends toward the shallow part, near the shore, which serves as a leader. This series of piles is called *tulis*. In spite of the absence of a gate the fishes do not easily escape once they are inside. Even small fishes, like sardines, cannot usually get out of the corral through the large mesh openings of the bamboo mattings.

A paugmad can be constructed at a cost of from 200 to 250 pesos, excluding the accessories in the form of *sigin* and the banca. The fishes inside the fish corral are usually caught by a small seine, called *sigin*, which is provided with lead weights along the lower edge and wooden floats at the upper edge and pull ropes on all sides. This net is usually dropped from either end of the fish corral, whence it is worked to the opposite end. The weighted side is hauled up, so as to convert it into a large dip net. The hauling is done every three or four hours of the day and at any time when a school of fishes enters the corral. Often the hauling is guided by a current indicator placed under the guard house or hut. The fishermen usually make the haul when there is very slight current or no current at all.

Unlike the bunsod in the neighborhood of Bohelabong and Kauluan Island of the Takut Tangug Bay, the paugmad of the Dipolog fishing grounds and neighboring places last only for six months, from January to June. All paugmad are usually destroyed at the onset of the southwest monsoon and they have to be reconstructed every year. Text fig. 3 is a diagram of the paugmad type of fish corral.

Another type of fish corral is the *pakubas*, which is more or less like the ordinary bunsod of the Moro fishermen. It is a small fish corral with two heart-shaped compartments, the *bunuan* and the *sagaran*, and with two wings and a leader. Here the walls, wing, and leader are all lined with closely woven bamboo matting (*siguid*). This fish corral is usually constructed close to the shore at a depth of from one to two fathoms, and can be easily transferred from one place to another. After the fishing season the materials used are removed and kept for the

following year, if they are not transferred to other favorable places. The cost of construction ranges from 100 to 200 pesos, depending on the size.

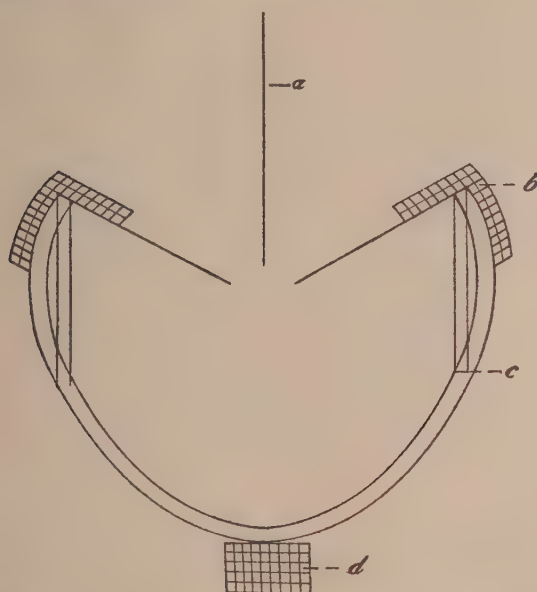


FIG. 3. Paugmad fish corral, a, tulis; b, bamboo platform; c, platform consisting of a single piece of bamboo for dragging the sign; d, hut.

A small banca or bamboo raft, together with a small abaca net about 3 meters long and 1 meter wide, are used in catching fish in this type of fish corral. The small abaca net with a bamboo pole at each end is used to scoop the fishes from the two chambers, from the sagaran to the bunuan. Two men manipulate the poles of the net, while another, in the water, holds the net to the bottom. The catch is dropped or emptied into a large bamboo basket. The operation is repeated at least three times until all the fishes are caught.

The catching of fish inside this corral is done at least two or three times a day. Text fig. 4 is a diagram of the pahubas type of fish corral.

Saluran, a fish corral similar to the ordinary pahubas, is constructed on rocky or corral reef shoals or on the shore. A fishing light is usually used in conjunction with it to attract the fishes.

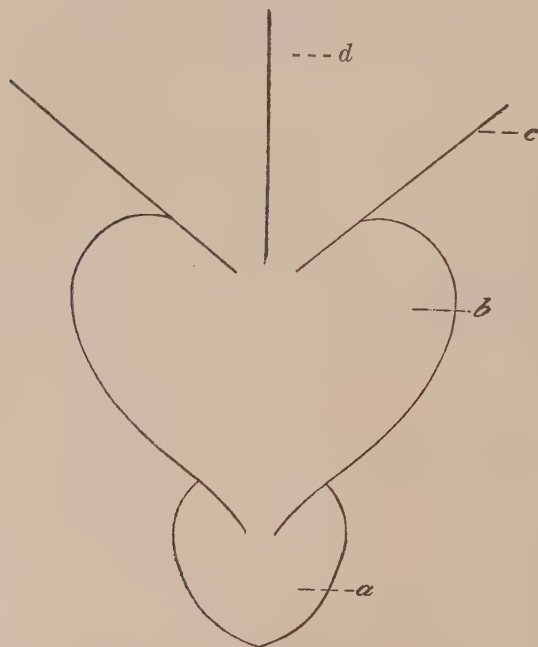


FIG. 4. Pahubas fish corral. *a*, bunuan; *b*, sagaran; *c*, pikpik; *d*, tulis.

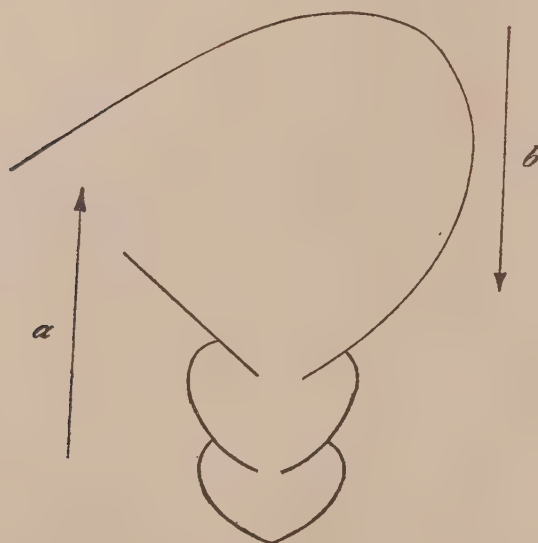


FIG. 5. Balerong fish corral. *a*, direction of flow at low tide; *b*, direction of flow at high tide.

Another type of small fish corral is the *balerong*, usually constructed along the sides or near the mouths of rivers for catching fishes that go upstream during high tide. During low tide the fishes are usually caught when they go back to the sea. The *balerong* is made of small wooden piles with finely woven bamboo mattings serving as a wall, the fishes caught inside the bunuan being scooped out with a dip net. Text fig. 5 is a diagram of the *balerong*.

Panera is another small-river fish corral, usually made of small wooden piles of fine bamboo mattings. It is usually placed along the side of a river at the mouth of a small creek in a swampy region. It may or may not have wings, depending upon the condition of the place. It may have one or two heart-shaped chambers. This type is used at the gate of all fishponds of the *Ilongo* type. During high tide fishes from the river usually go to the swamps and creeks, and when the water recedes they are caught on their return to the river through the creek inside the *panera*. The fishes are usually taken out of the corral by dip nets. Text fig. 6 is a diagram of the *panera*.

Tancub is another type of small fish corral, more or less similar to the *pahubas*, usually constructed near the mouth of a river or along the shores of enclosed bays. It is made of a series of small wooden piles with bamboo mattings, called *banata*, as walls. As in the other small fish corrals, the fish are collected in the terminal pound and are usually fished out with the *sigid* and a dip net or dip basket, called *sihud*.

The *ampas* is a modified fish trap composed of a *bobo* and a *lugo* and several pieces of coarsely woven bamboo matting joined together to form the wings. These are in the form of a letter V, leading to the terminal pound, the *bobo*. The *bobo* is usually placed in a shallow shoal among corals or rocks. A *lugo*, a triangular fish trap open at both ends, is placed at the entrance to the *bobo* with its smaller end firmly fixed to avoid the escape of fish from the junction of the two. From the side of the mouth of the *lugo* and extending almost to the shore are the coarsely woven bamboo mattings supported by a few small wooden piles serving as wings of the *lugo*. Except for the portion of the bamboo matting close to the shore, the fish corral is under water and is apparently intended for catching bottom-dweller fishes. In hauling the

catch, the bobo is detached from the lugo and brought up to the surface. In some places a pukot is used in the place of the bobo, and in the place of the coarsely woven bamboo mattings a series of coconut leaves strung to a long rope is used. The fishermen use this device to drive the fishes inside the enclosure. Text fig. 7 is a diagram showing the plan of the ampas.

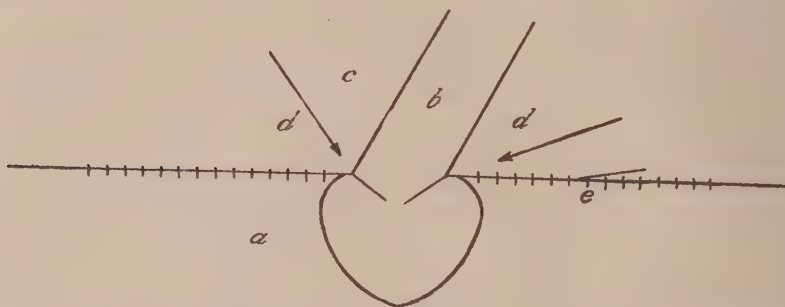


FIG. 6. Panera, river fish corral. *a*, river; *b*, creek; *c*, swamp; *d*, flow of water during low tide; *e*, wing of the panera or usually a bank of the river.

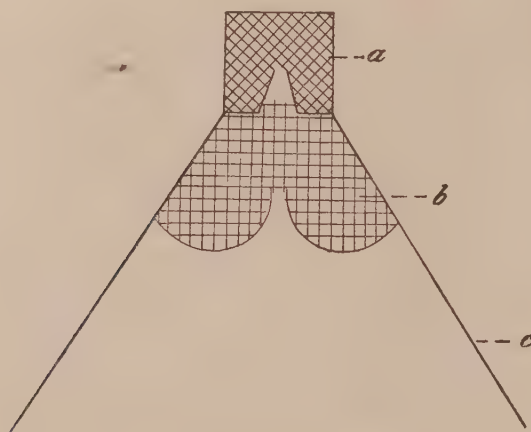


FIG. 7. Ampas fish corral. *a*, bobo; *b*, lugo; *c*, coarsely woven bamboo matting.

The bobo is the most common fish trap used by the Moro fishermen. It is usually a rectangular woven bamboo basket with an opening at one end provided with a long funnel-shaped piece of bamboo netting, called *galao*, to prevent the

fish from escaping once they are inside. In width and length the bobo varies from 1 to 3 meters, and in height from 0.5 to 1 meter. The shape is characteristic of the Moro type, which is different from bobos found in other places of the Philippines. The larger bobos are placed in deeper waters.

FISH NETS

Among the different fishing nets used, *chinchorro*, *baling*, *rede*, *pukot*, *lantao*, *atarraya*, *sakag*, and *salap*, are the most common.

Chinchorro.—The *chinchorro* is undoubtedly the most efficient fishing gear used along northern Zamboanga, where it has been introduced by the Visayan and Tagalog fishermen. Only few fishermen are using this net, which consists of a comparatively long conical pocket flanked by two long tapering wings of equal size. It varies a great deal in dimensions and is made up of several pieces cotton netting sewn together along the sides. A vertical wooden spreader, slightly shorter than the width of the wings at either extremity, is attached to the short extensions of the marginal ropes to prevent the wings from collapsing when dragged. Each spreader carries a bridle to which a long warp or pull rope is tied. Wooden cylindrical floats are evenly distributed along the float line and seamed by separate cords about 20 centimeters apart. Strung along the head line at regular intervals are lead weights in sufficient numbers to keep the net hung vertically when dragged. A stout cord is tied around the open end of the bag.

A *chinchorro* around 250 meters long may cost from 600 to 800 pesos and usually lasts for several years. This net is effective for catching fishes which do not come in large schools.

Baling.—The *baling* is a seine which is similar to the *chinchorro* in style and method of operation. The only difference is that it is made of abaca cloth. A *baling* around 250 meters long may cost from 300 to 500 pesos. Undyed *baling* may last only a few months. Some fishermen believe that undyed *baling* is more effective in catching fish than the dyed nets. This net is considered effective for catching small fishes, like anchovies and sardines which appear in large schools.

Rede.—The *rede* is similar to the *chinchorro* in materials and shape but much smaller, and the nettings are locally made. It is used on sandy-muddy shoals or shores and in some fishponds. It is a miniature *chinchorro* without a pocket.

Pukot.—The pukot used by the fishermen in Margosatubig and neighboring localities is different from that used in Luzon and the Visayas. It is a miniature baling, and sometimes called *basnig*. It is made of abacá cloth, from 20 to 40 meters long and about 2 meters deep, with a pocket about 10 meters long. It is usually operated in connection with a fishing vinta with a light which attracts and leads fish gently from the deeper waters to the shallower region where this pukot is placed and manipulated by one or two fishermen.

Lantao.—The lantao is a small gill net or miniature bating of the Tagalog fishermen. It is usually placed in fairly deep water across the current.

Atarraya.—The atarraya is a cast net sometimes known as *laya*. It is similar to the *dala* of the Tagalog. A moro fisherman poised in the prow of his vinta with the net properly arranged over his arm and shoulder throws the net over a school of fish. The forward portion of the net hits the water first, and the hind part, which is spread over the projected bamboo outrigger, follows. The vinta is paddled backward, dragging the rear portion of the net as far as possible to increase the scope of the apparatus. The casting of the net and the backward movement of the vinta are performed simultaneously with mechanical precision. This method calls for the help of two fishermen who dive immediately to drive the fishes within the scope of the net. The net is hauled up and slung across a cross piece to facilitate the removal of the catch.

Sakag.—The sakag is usually of $\frac{1}{4}$ inch mesh net, locally made. It is fastened to two bamboo poles crossed near one end and each provided with a small wooden shoe at the extremity. It is usually used on sandy beaches or inside fishponds, and pushed in front of the man who operates it.

Salap.—The salap is similar to the *sagap* of the Visayas. It is a small hand net, about 5 meters long and 1.5 meters wide, made of abacá cloth and strengthened along the four borders with abaca twine. The upper and lower margins are each attached to a stout abacá cord for holding. There are neither weights nor floats, so that either cord may serve as the bottom line. This net is used in catching bañgos fry in very shallow waters along sandy shores by two persons who hold the marginal cords at the corners and drag the net. It is also used for catching smaller fishes, like small mullets, in every shallow waters near the shore.

Ampis.—The ampis is another net made of abacá cloth and used in catching small shrimps of the genus *Palæmon*, locally called *baling* or *alamang*. It may be used in two ways. During high tide, when a school of small shrimps are seen inside the swamp, the ampis is stretched across the passage, so that during low tide when they are carried back to the sea, the shrimps are all caught. At other times, when shrimps are sighted the fishermen on a banca go after them and catch them with the ampis. The ampis is about 10 meters long or longer and 2 meters wide. It is a simple net, closely resembling the salap.

LUMINOUS LAMPS

Luminous lamps are the most common apparatus used in fishing in many places around Zamboanga Province. They are of various makes and vary from 600 to 1,800 candle power. In Margosatubig they are usually used in connection with the pukot. In other places they are used in hook-and-line fishing. Many fishermen abuse the use of luminous lamps in connection with the illegal use of poisonous substances, like *lagtang* or *tubli*. It is for this reason that the Municipality of Dipolog has passed an ordinance prohibiting the use of luminous lights in fishing.

FISHPONDS

The fishpond fishery, though not yet fully developed in Zamboanga Province, receives much attention, inspite of the abundance of fish caught in the sea. There are so far 12 fishponds under operation, and many more are being constructed or under application. All these fishponds, which vary from a few hectares to 176 hectares in size, are of the Ilongo type. With the exception of two, which are also of the Ilongo type, and one of semi-Malabon type, all are usually one-compartment enclosures irrespective of size. A one-compartment fishpond is perhaps better considered a mere fish trap, for it depends solely upon the fishes that enter the fishpond during high tide and are later caught during low tide by a small fish corral called *banata* (panera) (Plate 1, fig. 2; Plate 3, fig. 1). The dikes are poorly constructed, usually leaking, and the ponds are provided with one or two or more wooden temporary gates (Plate 1, fig. 3). At the gates are small fish corrals of the panera type, commonly called *banata*, which catch the fishes during the lowest tide of the new and full moon only. The fishes that are usually caught from these fishponds are the mullet (*lizas*), milkfish (*bangos*), tarpons (*buan-buan*), spade fishes (*kitang*), bar-

TABLE 1.—A list of the fishponds of Zamboanga Province.

Permittee.	Site.	Area.	Remarks.
		<i>Hectares.</i>	
Adaza, Victor.....	Lumatig, Dapitan.....	2.29	Expired Dec. 31, 1930.
Alfaro, Celestino.....	Mercedes, Zamboanga.....	2.15	Under construction.
Angeles, Manuel.....	Kalugusang, Lamitan.....	13.00	In operation.
Anito, Eufemio.....	Dinas, Zamboanga.....	13.00	Under application.
Agullar, Juan.....	Tumaguld, Lamitan.....	12.00	Expired Dec. 31, 1930.
Araneta, Antonio.....	Mulumulan, Mercedes.....	5.96	In operation.
Araneta, Francisco.....	do.....	9.00	Under application.
Arquiza, Ignacio.....	Yati, Talontalon.....	22.00	In operation.
Baling, Ricarda (Mrs.).....	Asinan, Boalan.....	13.50	Do.
Barte, A. L.	Camiton, Siocan.....	1.00	Under construction.
Do.....	do.....	1.00	Under application.
Binos, Pilar.....	Limbaguhan, Kabaslan.....	10.00	Do.
Buenabrazo, Mariano.....	Corillera de Putol, Tetuan.....	11.00	Under construction.
Caboverde, Q.....	Talon-talon, Zamboanga.....	3.00	Do.
Cainglit, Mrs.....	Kabaslan, Zamboanga.....		Under application.
Dignadice, Emiliano.....	Labangan, Pagodian.....	200.00	Do.
Dalmon, Victoriano.....	Das-das, Dipolog.....	1.90	Expired Dec. 31, 1930.
Doromal, Alfredo.....	Palawan, Dapitan.....	11.00	In operation.
Enriquez, Ramon.....	Cabaluay, Bolong.....	10.53	Do.
Evangelista, Gregorio.....	Salinas, Talon-talon.....	176.00	Do.
Francisco, Jaime.....	Asinan, Boalan.....	9.00	Under application.
Gregorio, Juan.....	Cabaluay, Taluksaṅgay.....	9.25	Under construction.
Locson, Francisco.....	Yati-Talon-talon.....	10.50	In operation.
Marcelo, Jesus.....	Gampis, Sindangan.....	3.63	Under construction.
Macapagal, Quirino.....	Zamboanga.....	23.00	Do.
Ortega, Paciano.....	Tyloy, Dipolog.....	12.80	Auctioned for public bldg- ding March 28, 1938.
Quebral, Medardo.....	Taluksaṅgay.....	5.50	Under application.
Payat, Juan.....	Talon-talon.....	36.80	Transferred to Julio Ce- bato. (Under construc- tion.)
Ramos, Y. Leoncio Cesar.....	Dipolog.....	16.77	In operation. Permittee deceased.
Ramos, Restituto.....	Talon-talon.....	22.60	In operation.
Rebollos, Angel.....	Manicaan, Zamboanga.....	3.60	Under construction.
Reyes, B. Honorato.....	Taluksaṅgay, Zamboanga.....	6.56	Under repair.
Reyes, Placido de los.....	Sibucan, Talontalon.....	18.90	In operation.
Reyes, Andres.....	Mampang, Talon-talon.....	50.00	Under application.
Rico, Macario.....	Baid-baid, Bolong.....	20.00	Do.
Saavedra, Inocencio.....	Mercedes.....	6.20	Do.
Salle, Optociano.....	Dipolog, Zamboanga.....	25.90	Under construction.
Santos, T. de los.....	Cabaluay, Manikaan Bo- long.....	4.60	Under application.
Tarroza, Salvador.....	Cabaluay, Bolong.....	12.75	In operation.
Torribio, Eugenio.....	Zamboanga.....	0.80	Under construction.

racuda (*rompecandado*), slipper (*kapalo*), siganids (*samaral*), snappers (*mangagat*), groupers and sea basses (*lapulapu*), some carangoids (*tarakitok*), shrimps (*baliskugay* and *lokou*), crabs (*alimango*), and others. The crabs are caught by means of bamboo traps, called *nasa* (Plate 2, fig. 3), which are usually baited with dead fish.

TABLE 2.—Data on marine and shallow-water fisheries of Zamboanga with the registered fishing gear for 1937.

Municipality or municipal district.	Fishing gear.		Operators.
	Kind.	Number.	
Dapitan.....	Pahubas.....	21	Christians.
	Paugmad.....	1	
	Saluran.....	5	
	Rede.....	8	
	Fishing light ^a	5	
Dipolog.....	Baling.....	4	Do.
	Balirong.....	8	
	Pahubas.....	4	
	Panera.....	2	
	Paugmad.....	18	
Kabasalan.....	Fish corrals.....	8	1 Christian and 7 Moros.
	Fishing light.....	8	Moros.
	Pukot.....	1	Chinese.
	Lantao.....	1	Moro.
	Rede.....	1	Christian.
Katipunan.....	Baling.....	16	Christians.
	Chinchorro.....	2	
	Fish corrals.....	45	
Margosatubig.....	Fishing light.....	136	131 Christians, 2 Chinese, and 3 Moros.
	Pukot.....	18	16 Christians, 1 Chinese, and 1 Moro.
	Ampla.....	9	2 Christians and 7 Moros.
Pagadian.....	Fishing light.....	30	26 Christians, 3 Moros, and 1 Chinese.
	Fish corrals.....	45	19 Christians and 27 Moros.
	Pukot.....	7	6 Christians and 1 Moro.
Sindaŕgan.....	Fish Corrals.....	7	Christians.
	Pukot.....	7	5 Christians and 2 Chinese.
	Fish corrals.....	7	5 Moros and 2 Christians.
Siocon.....	Bobo.....	1	Moro.
	Chinchorro.....	8	2 Christians and 1 Moro.
	Net (baling).....	4	2 Christians and 2 Moros
Zamboanga City:			
Bolong.....	Fish corrals.....	8	5 Moros and 3 Christians.
	Tancub.....	9	5 Christians and 4 Moros.
	Fish corrals.....	1	Moro.
Isabela de Basilan.....	Rede.....	2	Moros.
	Atarraya.....	4	3 Moros and 1 Christian.
	Lantao.....	6	Moros.
Lamitan.....	Pukot.....	1	Moro.
	Fish corrals.....	6	Moros.
	Pukot.....	1	Christian.
Maluso.....	Ampla.....	1	Moro.
	Atarraya.....	1	Do.
	Fish corrals.....	4	Moros.
Taluksaŕgay.....	Lantao.....	8	Do.
	Fishing light.....	81	19 Christians and 12 Moros.
	Fish corrals.....	85	81 Moros and 4 Christians.
City proper.....	Atarraya.....	6	Moros.
	Fish corrals.....	26	18 Christians and 8 Moros.

Total number of fishing gear.

Pahubas	25	Baling	20
Paugmad	19	Panera	2
Saluran	5	Balirong	3
Fishing light ^a	205	Fish corral	193
Redes	11	Chinchorro	5
Ampla	9	Pukot	35
Bobo	1	Lantao	10
Tancub	9	Atarraya	6

^a Accessory to other gear.

The only fishpond properly constructed is that of the late Dr. Cesar Ramos, of Dipolog, who came from Bulacan Province. It is a semi-Malabon type or a Malabon-Ilongo fishpond. The largest fishpond of Mr. Gregorio Evangelista, which is around 176 hectares, is being modified partly for raising milkfish in accordance with the suggestions given by the writer. This fishpond together with that of Mr. Ignacio Arquiza (Plate 3, fig. 1) are the only ponds with more than one compartment. Table 1 gives a list of the fishponds of Zamboanga Province, and Table 2 gives the marine and shallow-water fisheries of the province for 1937.

DEEP-SEA FISHING

Deep-sea fisheries around Zamboanga have lately been exploited by the fishing boats of the Sea Foods Corporation which started to use two fishing boats of 40.57 gross tonnage and 27.59 net tonnage each. Lately two other boats of 23.99 gross and 16.31 net tonnage, respectively, were added. These boats were registered as "Sea Foods No. 1," "Sea Foods No. 2," "Sea Foods No. 3," and "Sea Foods No. 5." The Company so far is using 106 men, distributed as follows: Sea Foods No. 1—15 Japanese fishermen-instructors, 1 Japanese cook and boy, 22 Filipino student fishermen, and 2 Filipino officers; Sea Foods No. 2—15 Japanese fishermen-instructors, 1 Japanese cook, 1 Japanese boy, 19 Filipino student fishermen, and 2 Filipino officers; Sea Foods No. 3—4 Japanese fishermen-instructors, 19 Filipino student fishermen, and 2 Filipino officers; Sea Foods No. 5—1 Japanese fisherman-instructor and 2 Filipino officers. Sea Foods No. 5, which has just been reconstructed after its acquisition, is being manned by fishermen from the other three fishing boats pending the appointment of new Filipino student fishermen. Lately, because of the strict enforcement of customs regulations, the number of Filipino student fishermen was reduced in all the fishing boats. The regulation providing that with the expiration of the 2-year term allowed the Japanese fishermen, only very few of them may be allowed an extension, tends to reduce the number of Japanese fishermen.

The monthly maintenance cost of the four fishing boats is around 1,300 pesos, including salaries, personnel, fuel, and fishing materials. The approximate cost of the fishing boats, including hull and engine, is 10,000 pesos each.

The tuna-fishing grounds around Zamboanga Province are Sibuguey Bay around Olutanga Island and the neighborhood

of Angosto Shoal; Moro Gulf in the neighborhood of Basilan Island; and Sulu Sea around the western side of the Zamboanga Peninsula, particularly in the neighborhood of Sangboy Island up to Port Santa Maria.

The fishing gear used are poles and lines with hooks of different types with both artificial and live bait (sardines). The best fishing season is from April to June, when one fishing boat in one trip of from one to two days usually catches around 7,000 tunas. During the other months of the year the boat catches an average of 2,000 fishes per trip of from three to five days.

Table 3 shows the number of fish caught, together with weight in kilograms, by all the Sea Food fishing boats by months.

TABLE 3.—*Monthly catch of the boats of the Sea Foods Corporation.*

Month and year.	Yellowfin.		Skipjack.	
	No.	Kg.	No.	Kg.
1937				
August.....	3,144	10,109	10,118	33,179
September.....	6,544	20,264	19,673	52,981
October.....	5,118	18,329	15,258	52,398
November.....	1,744	8,939	7,147	26,209
December.....	1,988	6,391	14,559	47,070
1938				
January.....	1,976	8,244	15,290	52,732
February.....	2,501	10,057	22,842	75,870
March.....	3,366	14,667	12,758	45,224
April.....	2,937	14,660	50,608	165,069
May.....	9,250	34,392	62,715	179,348
June.....	4,930	18,011	45,747	122,661
July.....	5,367	19,252	23,640	62,576
August.....	5,037	23,654	22,976	68,957
September.....	6,478	23,961	16,337	52,521
October.....	6,350	20,798	21,957	66,035
November.....	9,493	38,284	19,990	68,651
December.....	7,326	26,443	26,338	96,861

FISHERY RESOURCES

The principal fishery product of Zamboanga Province is fish of different varieties. Most of the larger fishes are sold fresh in the markets; others are sold to the different steamers and passenger boats that call at the Port of Zamboanga. S. S. "Mayon" alone buys no less than 500 kilograms of fish weekly. There are in addition many other passenger boats which buy fresh fish at this port. In all towns and principal barrios various varieties of fresh fish are sold in the market. There was not a single market that I have visited where fresh fish were not sold. In the markets of Isabela, Cabobo, and Maluso of Basilan

TABLE 4.—Commercial species of fishes and minor sea products caught in Zamboanga waters.

Local name.	English name.	Scientific name.
Agoot (lagonot or lepe).....	Spotted pomadasid.....	<i>Pomadasys hasta</i> .
Alakaak (tapos).....	Croaker.....	<i>Johnius aneus</i> .
Aligasín (lizas).....	Mullet.....	<i>Mugil labiosus</i> .
Aranan, patakla (gaggok) or (cagie).	Sea catfish.....	<i>Mugil dussumieri</i> .
Asogon (rompecandado).....	Barracuda.....	<i>Arius thalassinus</i> .
Ayungin (bebaan).....	Theraponid.....	<i>Sphyræna jello</i> .
Asohos (usus).....	Whiting.....	<i>Therapon plumbeus</i> .
Apahap (matakating).....	Sea bass.....	<i>Sillago sihama</i> .
Babansi (bigaong).....	Theraponid.....	<i>Lates calcarifer</i> .
Bagaong (langaat).....	do.....	<i>Pelates quadrilineatus</i> .
Baga бага (tinkitnik).....	Soldier fish.....	<i>Therapon jarbua</i> .
Bitilla (sampak).....	Porgy.....	<i>Myripristis melanoctictus</i> .
Bakokong moro (laondon ban-tok).	Fresh-water porgy.....	<i>Lethrinus opercularis</i> .
Bebang (isda kabakaba).....	Butterfly fish.....	<i>Sparus berda</i> .
Bia (kapalo).....	True goby.....	<i>Chætodon auriga</i> .
Bañgos (banlus).....	Milk fish.....	<i>Chætodon bennetti</i> .
Banbangin (tabong).....	Snapper.....	<i>Chætodon vagabundus</i> .
Batalay (balo, tamlawang).....	Garfish.....	<i>Glossogobius giuris</i> .
Batanpay.....	Parrot fish.....	<i>Chanos chanos</i> .
Biddid (sampangaray).....	Ten pounder.....	<i>Lutjanus fulvus</i> .
Binakoko.....	Dolphin.....	<i>Tylosurus strongylurus</i> .
Bokong (tusog).....	Slipper (goby).....	<i>Leptoscarus sp.</i>
Buan-buan (bulanbulan) (abu-long).	Tarpon.....	<i>Elops hawaiiensis</i> .
Bokong (tusog, kapalo).....	Slipper (goby).....	<i>Coryphæna hippurus</i> .
Bitilla (bahaba).....	Snapper.....	<i>Ophiocara procephala</i> .
Buging (pellangan or obud-obud).	Halfbeak.....	<i>Megalops cyprinoides</i> .
Bolador (Isdang lawin, sardinia or benke).	Flying fish.....	<i>Ophiocara aporos</i> .
Banak, talliong (balanak or lizas).	Mullet.....	<i>Lutjanus fulviflamma</i> .
Bongoan (gaggok).....	Sea catfish.....	<i>Hemiramphus far</i> .
Cabasi (tatik).....	Gizzard shad.....	<i>Cypselurus oligolepis</i> .
Caballas or linachay (anduhao).	Mackerel.....	<i>Cypselurus brevis</i> .
Cotot.....	Porgy.....	<i>Mugil vaigiensis</i> .
Dahong gabi (buna).....	Leaf fish.....	<i>Arius leiotocephalus</i> .
Dahonan (Idampao).....	Sting ray.....	<i>Anodontostoma chacunda</i> .
Dolean (tambangao).....	Snapper.....	<i>Nematalosa nasus</i> .
Dalagang bukid (sulig).....	Cesio.....	<i>Rastrelliger chrysotoonus</i> .
Dumpilas (tigi).....	Anchovy.....	<i>Lethrinus reticulatus</i> .
Dapang bilog (kulampira).....	Brill.....	<i>Platax orbicularis</i> .
Dapang haba (kulampira tabaco)	Sole.....	<i>Dasyatis kuhlii</i> .
Duhay (sampilrot).....	Pomfret.....	<i>Lutjanus decussatus</i> .
Damis, pampano (ampahan).....	Jack.....	<i>Crsio cuning</i> .
Dalupane (betebete).....	Moonfish.....	<i>Crsio xanthonotus</i> .
Dorado, lapis (lali).....	Leatherjacket.....	<i>Scutengraulis hamillonti</i> .
		<i>Thrissina baelama</i> .
		<i>Pseudorhombus arsius</i> .
		<i>Cynoglossus puncticeps</i> .
		<i>Stromateus niger</i> .
		<i>Hynnys moma</i> .
		<i>Mene maculata</i> .
		<i>Scomberoides lysan</i> .

TABLE 4.—Commercial species of fishes and minor sea products caught in Zamboanga waters—Continued.

Local name.	English name.	Scientific name.
Dilis (bolinao).....	Anchovy.....	<i>Stolephorus commersonii</i> .
Gele (bacalao) or langlanga.....	Sergeant fish.....	<i>Stolephorus heterolobus</i> .
Garopa, kalatang (patikan).....	Grouper.....	<i>Rachycentron canadum</i> .
Garapeche (mangali).....	Cavallas.....	<i>Epinephelus fuscoguttatus</i> .
Galangong (tumarong).....	Round scad.....	<i>Caranx speciosus</i> .
Lañgaray paco (gono).....	Silverside.....	<i>Decapterus macrostoma</i> .
Hasahasa, cavalla (tulay).....	Mackerel.....	<i>Atherina duodecimalis</i> .
Hito (tauti tubig).....	Fresh-water catfish.....	<i>Rastrelliger brachysomus</i> .
Ilak (palig).....	Rudder fish.....	<i>Clarias batrachus</i> .
Iso (ahaan or kalumbang).....	Snapper.....	<i>Kyphosus lemus</i> .
Kabang (manangin).....	Croaker.....	<i>Lutjanus argentimaculatus</i> .
Kitang (kikilo).....	Spade fish.....	<i>Sciæna dussumieri</i> .
Kalapo (kubing).....	Grouper.....	<i>Scatophagus argus</i> .
Kalaskasin (baggong).....	Snapper.....	<i>Cromileptes altivelis</i> .
Kandull (gaggok or cageue).....	Sea catfishes.....	<i>Pristipomoides microdon</i> .
Kalaso (lenseo).....	Lizard fish.....	<i>Arius thalassinus</i> .
Katchorita (subad).....	Bonito.....	<i>Trachinocephalus myops</i> .
Kambabalo (balo).....	Garfish.....	<i>Euthynnus yaito</i> .
Kapalo (palo).....	Slipper or goby.....	<i>Ablennes hians</i> .
Kataba (sumpit or sampirot).....	Archer fish.....	<i>Ophiocara sp.</i>
Kandaman.....	Bigeye.....	<i>Toxotes jaculator</i> .
Lababita (indangan or darong).....	Surgeon fish.....	<i>Priacanthus cruentatus</i> .
Lapad (kandaman).....	Herring.....	<i>Acanthurus bleekeri</i> .
Labian (lepe bato).....	Thick-lipped grunt.....	<i>Sardinella perforata</i> .
Lamkawit (dampalangan).....	Wrasse.....	<i>Plectorhinchus pictus</i> .
Langaray (blstayom).....	Cardinal fish.....	<i>Thalassoma quinquevittatus</i> .
Lapolapo (kuyapo).....	Grouper.....	<i>Aponichthys hyalosoma</i> .
Lapolapong Nglig (kohapo or kukkut).....	Grouper.....	<i>Epinephelus corallicola</i> .
Lapolapo (budyinga).....	do.....	<i>Epinephelus areolatus</i> .
Loko.....	Porcupine fish.....	<i>Epinephelus merra</i> .
Lumahan (cavalla).....	Mackerel.....	<i>Anyperodon leucogrammicus</i> .
Llwalo, tinlkan (puyopuyo).....	Climbing perch.....	<i>Diodon bleekeri</i> .
Matang baka (katambak or tulay).....	Bageye.....	<i>Rastrelliger chrysazonus</i> .
Mayamaya (mangagat or dapak).....	Snapper.....	<i>Anabas testudineus</i> .
Mayang (sapisapi or calcubao).....	Drepane.....	<i>Selar crumenophthalmus</i> .
Malakapas (bansa, babae, puruk).....	Mojarra (gerrid).....	<i>Lutjanus monostigma</i> .
Majuara (gaodgaod or mulmul).....	Porgy.....	<i>Lutjanus johni</i> .
Mulmul (ugus).....	Parrot fish.....	<i>Drepane punctata</i> .
Oriles (kubalkubal).....	Hardtail.....	<i>Gerris abbreviatus</i> .
Pating (tiburon or kaltan).....	Gray shark.....	<i>Gerris bacoenensis</i> .
Pagl (klampao).....	Sting ray.....	<i>Gerris filamentosus</i> .
Palid.....	Surgeon fish.....	<i>Gerris macrosomus</i> .
Paol (pagimanok).....	Eagle ray.....	<i>Argyrops spinifer</i> .
Parangparang (dahon tublo).....	Dorab.....	<i>Scarus sp.</i>
Palos (Indon).....	Swamp eel.....	<i>Megalaspis cordyla</i> .
Plit.....	Cyprinid.....	<i>Scoliodon palaeorhax</i> .
Pindanga (Indon).....	Piko eel.....	<i>Dasyatis uarnak</i> .
Pabuka (kasil).....	Moray.....	<i>Hepatus elongatus</i> .
Pellan (kopog).....	Lactarid.....	<i>Allobatus narimari</i> .
		<i>Chirocentrus dorab</i> .
		<i>Synbranchus bengalensis</i> .
		<i>Barbodes quinqueaculatus</i> .
		<i>Muraenesox cinereus</i> .
		<i>Gymnothorax pictus</i> .
		<i>Lactarius lactarius</i> .

TABLE 4.—Commercial species of fishes and minor sea products caught in Zamboanga waters—Continued.

Local name.	English name.	Scientific name.
Pipicao (lapis)	Leatherjacket	<i>Scomberoides tolooo</i> .
Parikit banks (kamai)	Remora	<i>Echeneis naucrates</i> .
Pugot	Trigger fish	<i>Balistes</i> sp.
Talipia (talangtalang)	Leatherjacket	<i>Scomberoides tolooo</i> .
Samundo	Snapper	<i>Lutjanus kasmira</i> .
Selanga (pagisange)	Devil ray	<i>Mobula eregoodoo</i> .
Sekoy (kutambang)	Pomadasid	<i>Pomadasys maculatus</i> .
Saramullete (tangbod)	Goat fish	<i>Upeneoides sulphureus</i> .
Saramullete (timbang)	do	<i>Parupeneus luteus</i> .
Samaral (balawis, budlong, bawis)	Siganid	<i>Teuthis javus</i> .
Sunog (kamangkamang buaya)	Flathead	<i>Amphacanthus vermiculatus</i> .
Sepsap (lawaylaway)	Slipmouth	<i>Amphacanthus fuscescens</i> .
Salaysalay aso	Mackerel	<i>Platycephalus indicus</i> .
Salmon (ulongulong, ungong)	Runner	<i>Platycephalus nematophthalmus</i> .
Sampak bakal	Snapper	<i>Equula equula</i> .
Spada (langing)	Scloopsis	<i>Caranx leptolepis</i> .
Tagisang lawin (sambukot)	Cutlass fish	<i>Elagatis bipinnulatus</i> .
Tarakitok (mansa)	Mackerel	<i>Lutjanus nematophorus</i> .
Tarakitok (isda puti)	do	<i>Scolopsis cancellatus</i> .
Trakitillo (butatikan)	do	<i>Trichurus haemela</i> .
Tagan (bilas)	Sawfish	<i>Caranx malabaricus</i> .
		<i>Caranx (Carangoides) gymnestethoides</i> .
		<i>Caranx armatus</i> .
		<i>Pristis microdon</i> .
Tamban (kasig)	Herring	<i>Dusseumeria hasseltii</i> .
		<i>Sardinella longiceps</i> .
		<i>Sardinella leiogaster</i> .
		<i>Sardinella perforata</i> .
		<i>Sardinella fimbriata</i> .
		<i>Sardinella melanura</i> .
Tamban (haothaol)	do	<i>Sardinella sirm</i> .
Tambacol (panit or barellete)	Yellowfin	<i>Neothunnus macropterus</i> .
Talapia, lapis (lali)	Leatherjacket	<i>Scomberoides lysan</i> .
Tongtong	Nemipterids	<i>Nemipterus nemurus</i> .
Torcillo (lambana, tinduktingduk)	Barracuda	<i>Sphyræna obtusata</i> .
Tanguingui (tanigue)	Spanish mackerel	<i>Cybius commerson</i> .
Tallmosak (tuong uluan)	True goby	<i>Oxyurichthys microlepis</i> .
Tuakan (bolinao)	Anchovy	<i>Stolephorus indicus</i> .
Tulingan (puyan)	Skipjack (ocean bonito)	<i>Katsuwonus pelamis</i> .
Tulingan (subad)	Bonito	<i>Euthynnus yaito</i> .
Tulingan (mangko)	Frigate mackerel	<i>Auzis thazard</i> .
Sponja	Elephant ear sponge	<i>Leiodermatium pfeifferi</i> .
Do	Common bath sponge	<i>Euspongia irregularis</i> .
Do	Sheep's wool sponge	Undetermined.
Coral (acalbahal)	Black coral	<i>Antipathes abies</i> .
Tombongtombong (tamban buhan)	Sea anemone	Undetermined.
		<i>Actinopyga mauritiana</i> .
		<i>Microthele nobilis</i> .
		<i>Holothuria pardalis</i> .
Balatan (bat)	Sea cucumber	<i>Holothuria atra</i> .
		<i>Holothuria scabra</i> .
		<i>Holothuria fuscocinerea</i> .
		<i>Thelenota ananas</i> .
		<i>Holothuria maculata</i> .

TABLE 4.—Commercial species of fishes and minor sea products caught in Zamboanga waters—Continued.

Local name.	English name.	Scientific name.
Baling (alamang).....	Small shrimp.....	<i>Palamon</i> spp.
Camaron (baliscugay).....	Shrimps.....	<i>Penaeus</i> spp.
Lokon.....	do.....	<i>Penaeus monodon</i> .
Ulang (banagan).....	Spiny lobster.....	<i>Palinurus</i> sp.
Cangrejo (alimango).....	Crab.....	<i>Charybdis crucifera</i> .
		<i>Scylla serrata</i> .
Cangrejo (alimassag).....	Blue crab.....	<i>Neptunus pelagicus</i> .
		<i>Neptunus (Achelous) granulatus</i> .
Dawat.....	Crab.....	<i>Thalamita dana</i> .
Do.....	do.....	<i>Thalamita pyrama</i> .
Kokomo (karag).....	do.....	<i>Thalassina anomalia</i> .
Alupihang dagat (common).....	Sea mantis.....	Do.
Cucuracha (sambao).....	Raninid crab.....	<i>Squilla</i> spp.
Pusit (choca or tabula).....	Squid.....	<i>Ranina dentata</i> .
Panus (bangolon or kulabutan).....	Cuttlefish.....	<i>Loligo</i> spp.
Borsebala (coguita).....	Octopus.....	<i>Sepia</i> spp.
Marisco (kuhan).....	Ear shell.....	<i>Octopus</i> spp.
		<i>Haliotis</i> spp.
		<i>Rostellaria cancellata</i> .
Sesi (sehi).....	Marine snail.....	<i>Bursa gyrina</i> .
		<i>Turricula corrugata</i> .
		<i>Strombus luhuanus</i> .
Lalong or bolalo (lagong).....	Green snail, turban shell.....	<i>Turbo marmoratus</i> .
Trocha (laak).....	Smooth top shell.....	<i>Trochus niloticus</i> .
Trocha (simong).....	Rough top shell.....	<i>Trochus maximus</i> .
Trocha (babae).....	Hirose shell.....	<i>Trochus noduliferus</i> .
Concha blanca (tipay).....	Gold-lip pearl shell.....	<i>Pteria maxima</i> .
Concha negra (tipay).....	Black-lip pearl shell.....	<i>Pteria margaritifera</i> .
Taelobo (kima).....	Giant clam.....	<i>Tridacna gigas</i> .
Do.....	Bear's paw shell.....	<i>Hippopus maculatus</i> .
Capla.....	Window shell.....	<i>Placuna placenta</i> .
Oreja (kiongkiong).....	Ear shell oyster.....	<i>Pteris savignyi</i> .
Binkong.....	Long fan mussel.....	<i>Pinna philippinensis</i> .
Do.....	Short fan mussel.....	<i>Pinna negra</i> .
Turtuga.....	Sea turtle.....	<i>Chelonia japonica</i> .
Do.....	Hawksbill turtle.....	<i>Eretmochelys imbricata</i> .
Do.....	Loggerhead turtle.....	<i>Caretta olivacea</i> .

Island large fresh fish are always on sale. Most commonly sold are the different species of tuna, bonito, Spanish mackerel, barracuda, carangoids of different species, sergeant fishes, a fish locally known as *bacalao*, snappers, groupers, and sea basses; and many other smaller kinds, like sardines, anchovies, and others. Most of these fishes are caught in fish corrals, others by hook and line, spear, salapang, fish trap (bobo and others) and by fishing nets of different types. Most fish come from the Boholebong and Kauluan grounds. Fish are usually cheap. A good-sized tuna costs only from 20 centavos up, a bonito 10 centavos, a large-sized tanguingue and rompecandado from 80 centavos to 1.20 pesos, while a large tarakitok costs from 50 centavos up. Some fishes are sold in slices.

Different varieties of fresh fish are principally sold in the markets of Zamboanga, Lamitan, Isabel, Dipolog, and Margo-satubig. In Zamboanga, which is a port city, the cost of fish is much higher than in other places. A number of dried fish products are also sold in the different towns.

Minor fishery products are also sold in the different markets, the most common being different varieties of crustaceans, like the *lokon*, *alimango*, *cucuracha*, *baliskugay*, *baling* or *alamang*, and *Squilla* or sea mantis. Among the molluscs are the squids, cuttlefishes, octopus, and different species of clams and snails. Among the echinoderms and coelenterates, different species of holothurians, like *Holothuria pardalis*, *Holothuria maculata*, *Holothuria fuscocinerea*, and others, and different species of sea anemone, from small to large forms, are sold fresh in many markets. Turtle meat (*Chelonia japonica*) and eggs are also commonly sold in many places. In Zamboanga market alone there are times when a dozen of these large turtles are butchered at the rate of one or two a day. A kilogram of turtle meat is sold for 10 centavos, and one turtle may bring 3 to 5 pesos. Usually around 150 eggs with shells and 500 without shells are removed from the body cavity of a female turtle. The eggs with shells are sold at 1 centavo each and those without shells are sold at 2 for 1 centavo. Some turtles are caught inside fish corrals, while others are caught by Moro fishermen. Most turtles sold in the market are taken from the neighborhood of Sibago and Lanhil Islands.

Other fishery resources of the province are commercial shells of different kinds and other minor marine products, like *trepang* or dried holothurians, sharkfins, tortoise shells, *baguog* or *guinamos*, *binoro*, dried fishes, dried shrimps or *hebi*, dried squids and cuttle fishes, and some edible algæ. Commercial sponge is another marine product which has potential value, as it is abundant in the waters surrounding Zamboanga Province. Waters around the Taluksaṅgay channel, Sacol Islands, and neighboring places were exploited for the commercial elephant ear sponge, *Leiodermatium pfeifferae*, and the sheep's wool variety by a foreign sponge concessionaire by the name of P. I. Pipinos, of the Greek Sponge Company. Since then these sponges were left untouched and the stock allowed to become rehabilitated. Shallow-water sponges of the species *Euspongia irregularis* are met with in large numbers

and can be scientifically propagated. Among the commercial shells found around Zamboanga Province are the pearl oysters of the species *Pteria maxima*, *Pteria margaritifera*, and *Pteria savignyi*; top shells of the species *Trochus niloticus*, *Trochus noduliferus*; green snails of the species *Turbo marmoratus*; and window shells of the species *Placuna placenta*. Other bivalves, like *Tridacna gigas*, *Hippopus maculatus*, and other related species, may have potential commercial value for ornamental purposes, for ground shells, lime, and other uses. Black corals, of different varieties of *Antipathes abies*, are another marine product of high commercial value, formerly abundant in the waters surrounding Zamboanga Province, but because of overfishing now more or less depleted; with proper regulatory measures for the collection of this valuable product, it could be conserved. Among the commercial holothurians abundant around Zamboanga Province are *Actinopyga mauritiana*, *Microthele nobilis*, *Holothuria pardalis*, *Holothuria atra*, *Holothuria scabra*, *Holothuria maculata*, *Thelenota ananas*, and a few others. Table 4 shows the commercial species of fish caught in Zamboanga waters.

FISH PRESERVATION

Generally fishes are sold fresh. Those that are not sold and consumed fresh are usually preserved dry or iced. A small refrigeration business is undertaken by Mr. James J. Wilson in connection with his ice plant. Because of the additional expense in maintaining a cold storage plant, Mr. Wilson does not usually keep the machine running at full capacity. At times large fishes sold to Compañía Marítima boats and other vessels are stored in this ice plant until the boat arrives. A limited cold storage business is done by Mr. Antonio Bayot, of the Plaza Hotel, where the fishes supplied to the S. S. "Mayon" by Moro Biri are temporarily stored before they are taken to the boat. The Sea Foods Corporation maintains its own cold storage plant, where its tuna fishes are frozen and stored.

More cold-storage facilities are needed in the city as well as in other localities of Zamboanga Province where the fish supply is abundant. Lamitan, Dipolog, and Margosatubig are in need of cold storage facilities. The small refrigeration units at present found in the city are of great help to the fishermen and residents of Lamitan, Dipolog, and Margosatubig, as because of the absence of cold storage plants in these principal fishing

towns the fish usually spoil and go to waste, especially when the fishermen run out of salt.

DRYING

Drying fish is practiced only when absolutely necessary. In Margosatubig, Tantawan, and other places, however, fish drying is considered a part of the business of the Chinese fish dealers, who have regular drying platforms along the waterfront where fishes are dried after salting (Plate 4, fig. 1). At other places fish are occasionally dried along the beaches, where they are placed on bamboo matting laid flat on the ground or on raised temporary platforms. Tarakitok, cavallas, tamban, and bolinao are the fishes dried. The last-named is usually dried without salt during sunny days. Tamban and small cavallas are immersed in brine solution in the round from two to twelve hours and usually dried whole. Larger fishes are usually split into halves from the dorsal side and sprinkled with salt before drying.

SALTING

Salting is done in two ways: dry salting and brining. In the former the salt is sprinkled on the product to be preserved. This is done in two proportions, (a) 1 part salt and 2 parts fish, a mixture known as *sinabado*, where the fish ferment early and are not kept long, and (b) 2 parts salt and 1 part fish. In the latter the mixture takes longer to ferment and the product usually keeps longer. In brining the following proportion is used: (a) 50 cans^{*} fish to 25 cans of sea water with 3 sacks of salt, or (b) 50 cans fish to 20 cans of sea water with 2 cans of salt.

In the bagoong or guinamos industry small fishes, usually sardines (lupoy) and anchovies (bolinao) are used. In Dipolog only Filipinos, mostly fishermen, are engaged in this industry. In Margosatubig, Tantawan, and other places the business is entirely in the hands of the Chinese. The cost of material and labor per 5-gallon can of guinamos in Dipolog is as follows: fish, 60 centavos; salt, 15 centavos; can, 25 centavos; labor, 11 centavos. A can of guinamos sells at from 1.40 pesos up to 1.80 pesos. Most of the product is sent to the Visayan Islands.

In Margosatubig the cost of the material is lower (fish, 40 centavos; salt, 12 centavos; can, 20 centavos; labor, 10 centavos). In this place a can of bagoong or guinamos sells for from 1 peso up to 1.20 pesos.

* Empty 5-gallon petroleum cans.

BINORO

Another fish product is the *binoro*, made principally in Dipolog and neighboring localities. The making of binoro is seasonal, being done from January to May, with March and May as peaks of the season. Every year the production is becoming greater, products being marketed in Dumaguete, Oriental Negros Province, in the neighboring municipalities, and in the interior towns of Zamboanga Province and neighboring provinces. Herrings of the species *Sardinella sirm*, locally known as *tamban haolhaol*, cavallas of the species *Rastrelliger chrysozonus*, locally known as *anduhao*, and other related fishes are used in making binoro. The fish is salted and left to ferment for four to ten hours. The salted fishes are then placed in layers inside a petroleum box or finely woven bamboo basket. Salt is sprinkled over each layer in the case or basket.

The cost of material and labor per case of binoro is as follows: fish, 3 pesos; salt, 50 centavos; box, 20 centavos; labor, 15 centavos. One box or case of binoro sells at from 4 pesos to 8 pesos. A basket of binoro is equivalent to about 3 cases and sells at from 14 pesos to 18 pesos.

PATIS

Patis is usually prepared from extracts or sauce of salted *lupoy* or *bolinao*, which are stored in large vats or barrels for at least a year. The sauce is then filtered and later boiled. Patis-making is not a regular industry, only a few fishermen in the guinamos industry preparing this product on a small scale and for home consumption.

SMOKING

Smoking fish is not popular, and hardly known to the fish dealers of Zamboanga. Moros, however, smoke and roast their common favorite fishes, like the tulingan and tarakitok. The fish is partly roasted and smoked and sold in every market where there are Moros. It is said that fish smoking was started by a Tagalog fisherman at Dipolog but did not prosper, due perhaps either to the fact that smoked fish has a peculiar taste or to faulty preparation. At present there are persons interested in fish smoking; to these the methods used in Manila and in neighboring places, together with the improvements made by the Division of Fisheries, are recommended.

It is believed that if a scientific method of smoking fish is introduced in Zamboanga Province the business may prosper and may help salvage fresh fish in times of abundance.

CANNING

The most up-to-date method of fish preservation in Zamboanga Province is the canning of tuna fishes by the Sea Foods Corporation (Plate 5). The tuna used by the cannery are the yellowfin (*Neothunnus macropterus*), the skipjack (*Katsuwonus pelamis*), and a few other species and varieties. These are caught by means of pole and hook and line, with both artificial and live bait. The tuna-fishing season is during April, May, and June. During this period the cannery runs at full capacity and employs over 150 women. Several men are employed to do the more strenuous manual work and in fish dressing. In addition, a few men are employed in packing and in attending the retorts and other machinery.

The maximum cannery output per day is 500 cases, each case containing 48 cans. The average daily output is from 200 to 300 cases, with 40 to 50 kilograms of fish per case. The average weight of the skipjack is 3 kilograms, so that a case of 48 tuna cans of the "light meat" requires from 13 to 17 fishes. A yellowfin has an average weight of 5 kilograms, so that a case of 48 cans of "white meat" requires from 8 to 10 fishes. The monthly shipment of finished product to the United States is from 3,000 to 4,000 cases, with an approximate value of from 27,000 pesos to 36,000 pesos.

Canning method.—After the fish are dressed and cleaned by the gutters they are arranged dorsal side up in iron crates and conveyed to the cooker by a conveyor. The cannery has 3 cookers, accommodating about 1,188 fishes, and cooking is done by steam generated by a boiler. The cooking period takes 2 hours under 2-pound pressure and at a temperature of 210° F. After cooking the fish are allowed to cool and harden overnight and then split into longitudinal halves, the vertebral columns removed, and each half in turn again split into quarters along the lateral line. The four pieces produced from one fish are arranged in piles on the dressing table and carried to another table where women peel off the skin and remove the blood and other undesirable parts. The cleaned pieces are laid on wooden trays and cut into sections in the wooden cutting apparatus with the use of a large sharp knife. The sections, which are slightly shorter than the height of the cans, are taken to the filling table where women place them by hand inside the cans (Plate 6). The cans are first brought

by a conveyor to the salt and oil table where women add measured amounts of refined salt and cotton seed oil. They are then filled with four sections of meat and passed to the weight checkers who weigh each can with a small balance. The filled cans are then conveyed to the other end of the table where more oil is added to fill the space. Then the tops are placed on the cans, and they are conveyed to the sealing machines. (The company has a double seaming machine which seals at the rate of 60 cans per minute, and a small sanitary vacuum seamer which seals at the rate of 10 to 15 cans per minute). From the seamer the sealed cans are carried mechanically to the washing tank where they are washed with hot lye solution to remove grease and oil. From the washing tanks they are arranged on carriers and then taken to the horizontal retort for processing or sterilization. Formerly, after this process, they were retorted for at least 2 hours under 7-pound pressure at a temperature of 240° to 250° F.; at present the time is greatly shortened and the amount of pressure almost double under the same temperature.

From the retort the cans are conveyed to a large concrete tank of cool water where they are immersed for cooling. A more recent cooling device is made inside the retort where a cool water sprayer does the cooling without the sterilized canned products being immersed into the concrete tank of cool water. Then each can is tested and checked by a leak tester. After the leaking cans are condemned, the tested cans are taken to the cleaning department where they are cleansed and polished with sawdust and other cleansing materials, labeled and crated. The Sea Foods cannery prepared two kinds of pack, the "fancy" and the "flakes." The fancy pack, described above, consists of solid meat sections, while the flakes consist of slightly salted small pieces of meat and some scraps from the clean lobes, mashed up before oil is placed in the can. There are two kinds of fancy product, the "white meat" and the "light meat." The former is made from the yellowfin tuna and the latter from the skipjack. Two other new products are prepared, the seasoned tuna flakes and those with some kind of sauce and flavoring materials used instead of the oil. These latter products are intended for the local market.

Table 5 shows the monthly production of the Sea Foods Cannery at Zamboanga.

TABLE 5.—*Monthly production of the Sea Foods Cannery at Zamboanga.*

Month and year.	White meat.		Light meat.		Total.	
	Cases.	Cans.	Cases.	Cans.	Cases.	Cans.
1937						
August.....	315	18	960	46	1,276	16
September.....	378	44	1,024	42	1,403	38
October.....	571	26	1,352	33	1,924	11
November.....	114	20	1,083	19	1,197	39
December.....	158	10	862	34	1,020	44
1938						
January.....	386	20	1,772	35	2,159	7
February.....	320	20	2,246	38	2,567	10
March.....	497	45	1,382	10	1,880	7
April.....	248	31	2,772	22	3,021	5
May.....	1,015	31	3,873	28	4,889	11
June.....	704	26	3,642	33	4,347	11
July.....	525	33	1,171	40	1,697	25
August.....	717	25	2,137	14	2,854	39
September.....	566	43	1,155	9	1,722	4
October.....	712	9	1,299	23	2,011	32
November.....	909	1	2,042	9	2,951	10
December.....	1,001	41	2,590	37	3,692	30

SUMMARY AND RECOMMENDATIONS

1. The principal shallow fishing grounds of Zamboanga are Margosatubig, Tantawan, Takut Tangug Bay, Dipolog, and Sindangan Bay, and practically the entire coast line surrounding the Zamboanga Peninsula.

2. For the conservation of the fishery of some depleted fishing grounds, like that of the Igat Bay, fishing with light in connection with the pukot should be regulated.

3. More sanitary supervision over the preparation of guinamos or bagoong and the drying of fish is necessary to improve the quality of the products turned out.

4. Refrigeration should be resorted to in the preservation of fresh fish in the important fishing centers.

5. Deep-sea or off-shore fishing must be exploited. Filipino capital should be induced to invest in the fishing industry, and fishing boats of over 20 tons should be used.

6. Primitive fishing gear must gradually be replaced with modern types.

7. Illegal fishing methods with the use of explosive and poisonous substances must be checked.

8. Other fishery products besides fish must also be given proper attention.

9. Canning of other fishes, like sardines, cavallas, and the like, must be developed as a means of proper fish utilization.

10. Other methods of fish preservation, like smoking, patismaking, and the like, must be encouraged.

11. The bañgos fishpond of the Malabon type must be encouraged.

12. A tuna cannery similar to the Sea Foods Corporation, under a semigovernment organization like the National Development Company, must be encouraged, to exploit the extensive tuna-fishing grounds around Zamboanga Province.

ILLUSTRATIONS

PLATE 1

- FIG. 1. Bobo, a typical fish trap, used around Manicaan.
2. Banata, a small fish corral usually constructed at the gate of fishpond at Ramos fishpond, Mampang.
3. A portion of a fishpond showing two wooden gates at Arquiza's fishpond, Talontalon.

PLATE 2

- FIG. 1. A cast net, laya, being dried at Bohelebong.
2. A sakag used around Talontalon.
3. Bamboo crab traps, called nasa, and a dip net, sihud, used for catching fish from the banata.

PLATE 3

- FIG. 1. A portion of a fishpond showing a gate and banata at Evangelista's fishpond, Salinas.
2. A portion of the Arquiza fishpond, showing a rede, a small net, used for catching fish from one of the smaller compartments.
3. A bunsod, showing the bunuan and the small hut where fisherman stay day and night.

PLATE 4

- FIG. 1. A *batalan* fish-drying platform of one of the Chinese fish dealers at Margosatubig.
2. Some of the game fishes sold at the Isabela market. They are baracuda, Spanish mackerel, and talakitok.
3. A portion of the Isabela market, showing tanguingue fish or Spanish mackerel (*Cybium commerson*), a common fish sold at the rate of from 80 centavos to 1.20 pesos each.

PLATE 5

A view of the Sea Foods Cannery at Zamboanga.

PLATE 6

Packing tuna fish at the Sea Foods Cannery.

TEXT FIGURES

- FIG. 1. Bunsod fish corral. *a*, bunuan; *b*, sagaran; *c*, kaluagan; *d*, pikpik; *e*, pamansan.
2. Variations of the bunsod. *a*, bunuan; *b*, sagaran; *c*, kaluagan; *d*, hut.
3. Paugmad fish corral. *a*, tulis; *b*, bamboo platform; *c*, platform consisting of a single piece of bamboo for dragging the sign; *d*, hut.

- FIG. 4. Pahubas fish corral. *a*, bunuan; *b*, sagaran; *c*, pikpik; *d*, tulis.
5. Balerong fish corral. *a*, direction of flow at low tide; *b*, direction of flow at high tide.
6. Panera, river fish corral. *a*, river; *b*, creek; *c*, swamp; *d*, flow of water during low tide; *e*, wing of the panera or usually a bank of the river.
7. Ampas fish corral. *a*, bobo; *b*, lugo; *c*, coarsely woven bamboo matting.



PLATE 1.



1



2



3



PLATE 3.



PLATE 4.



PLATE 5.



PLATE 6.

EPIBLASTUS IN THE PHILIPPINES

By L. O. WILLIAMS

Of the Botanical Museum, Harvard University, Cambridge, Massachusetts

About twenty species of the genus *Epiblastus* have been described, extending, in range, from Samoa to Celebes, with about fifteen of the described species originating in New Guinea. The species described below is the first species of the genus known to occur in the Philippine Islands. In Merrill's Enumeration of Philippine Flowering Plants the genus should be added to the Orchidaceæ, between *Dilochia* and *Ceratostylis*.¹

EPIBLASTUS MERRILLII Williams sp. nov.

Herba epiphytica. Pseudobulbi cylindracei, unifoliati. Folia lineari-lanceolata, acuta vel plusminusve obtusa, apice sine lobis, coriacea. Flores fasciculati ex apice pseudobulbi terminalis. Sepalum dorsale late lanceolatum, acutum vel acuminatum, leviter naviculare, obscure quinquenervium. Sepala lateralia late lanceolata, basi obliqua. Petala lanceolata, acuminata. Labellum rhomboideum, lamina obovata sed cum apice acuminato. Columna et anthera generis.

An epiphytic herb up to about 4 dm long. Roots filiform, pubescent, small. Pseudobulbs cylindrical or probably somewhat flattened, especially terminal portion, stem continuing from middle of each pseudobulb, pseudobulbs 1-leaved, apparently only the terminal (annual) one bearing the few-flowered inflorescence. Usually several chartaceous sheaths at base of pseudobulbs. Leaves linear-lanceolate, acute or somewhat obtuse, not lobed at apex, coriaceous, 15 to 35 cm long, 2 to 3 cm broad. Flowers about ten, fasciculated from apex of terminal pseudobulb, on slender peduncles. Peduncles slender, terete, up to about 10 cm long. Bracts small, peltate at base, acuminate. Dorsal sepal broadly lanceolate, acute or acuminate, slightly naviculate, obscurely 5-nerved, about 8 mm long and 3 mm broad. Lateral sepals broadly lanceolate, acuminate, strongly oblique at base, 10 to 12 mm long, about 4 mm broad. Petals lanceolate,

¹ Merrill, Enumeration of Philippine Flowering Plants 1 (1925) 317.

acuminate, 3-nerved, about 7 mm long and 2 mm broad. Lip rhomboid in outline, about 9 mm long and 4 mm broad, blade obovate but with a lanceolate apex which is nearly as long as the blade, disc with a callus plate. Mentum prominent, about 2 mm long. Column and anther of the genus.

MINDANAO, Zamboanga Province, Sax River Mountains, *Merrill 8155*. Type in Herb. Ames; isotype in Philippine National Herbarium, Bureau of Science, Manila, November 28, 1911, epiphyte, altitude about 1,000 meters: Bukidnon Province, Mount Candoon, *Bur. Sci. 38911a Ramos & Edaño*, June and July, 1920, on tree, mossy forest slopes: Cotabato Province, Mount Matutum, *Bur. Sci. 85450 Ramos & Edaño*, April 10, 1923, flowers red, altitude about 2,350 meters.

Epiblastus Merrillii seems to be distinct from all other species of the genus in the structure of the flowers and of the pseudobulbs.

BOOKS

Books reviewed here have been selected from books received by the Philippine Journal of Science from time to time and acknowledged in this section.

REVIEWS

American Medical Association Interns' Manual. Edited by the Council of Medical Education and Hospitals and the Council on Pharmacy and Chemistry of the American Medical Association. Chicago, American Medical Association, 1938. 230 pp. Price, 60 cents.

This highly practical manual is an attempt to provide a sound basis for the training of interns who wish to make the best of practical knowledge in medical training. As successor to the handbook, "Hospital Practice for Interns," the manual differs from its forerunner throughout its contents, but aims at the same purpose of providing the intern with helpful suggestions as to his conduct in the performance of his services to both the hospital and the public, basic data of reference, particularly to the laboratory and emergency cases, and exceedingly useful information as to drugs and dietary therapeutics of established and proved value. In short, the mission of this book is the installation and preservation of a sound and wholesome relationship between trainers and trainees, the correction of evils most likely to influence interns and young physicians, and the encouragement of these to continue their delicate task.

The opening pages give general information regarding internship and residence. A discussion of the technical considerations of the relationship of an intern and the hospital administration follows. In the practical application of knowledge, most interesting to interns are first-aid treatment and management of emergency cases, laboratory procedures of examination, the useful drugs as arranged therapeutically, the aid in food prescriptions in normal and special diets with illustrative tables, physical therapeutics, and the legal aspects of internship.

The manual brings forth the needs of interns that are always foremost. It is an excellent companion of the hospital rule book and formulary—S. A. E.

Philippine Pagans. The Autobiographies of Three Ifugaos. By R. F. Barton. London, George Routledge & Sons, Ltd., 1938. 271 pp., illus., front. Price, 15s.

This book is the outcome of a field trip made by Doctor Barton to Ifugaoland. The author makes it clear in his preface that the biographies are "presented only as primitive documents" which he hopes will be useful to others as well as to himself in further studies.

The book opens with a chapter on "How the Ifugaos live" setting forth their particular region, sources of livelihood, skill and industry, organizations, religion, customs, and other characteristics of the tribe.

The following three long chapters are autobiographies of three typical individuals written "as nearly in the way they were related" to the author. The revelations center on the art of love, courtship, and marriage, which are very peculiar to these mountaineers. The biographies are exhaustive in their expositions on the "promiscuity and irresponsibility (from our point of view) of sex relations . . . and the minimal selectiveness on the part of both sexes in initiating these relations." On the other hand the sanctity of marriage among the Ifugao is a very striking contrast to such promiscuity and irresponsibility. The conditions under which divorce may be granted an estranged husband or wife without serious consequences are set forth in the book. The gentleness of the Ifugao in peace and his fierceness when provoked, especially when family pride is at stake, are very well brought out in the narrations.

Doctor Barton incidentally describes the highly developed coöperative labor system among these pagans. Their fairness in the give-and-take system in rational economic life is remarkable. He has recorded and made explanations of many rituals, beliefs, customs, and omens of the Ifugaos.

The book is interesting, instructive, and readable. Its circulation, however, should be limited to "mature readers and students of anthropological and social sciences."—Q. A. E.

Men, Medicine and Food in the U. S. S. R. By Fe Le Gros Clark and L. Noel Brinton. London, Lawrence and Wishart, 1936. 173 pp., illus. Price, 5s.

This book is a brief description of the rise and growth of Soviet health and food services. The writers in a space of 167 pages have tried to give a clear picture of how Soviet Russia has been approaching one of the biggest problems of

today—the food and health of the people. According to the authors, three points must be kept in mind in interpreting what is happening there. First, that the country is still in the process of growth; second, that the conditions as they are found should be judged in relation to the conditions as they were in 1917; and third, that there is in that country a new civilization unlike any with which we are familiar. In this book they pictured how the people are attacking their problem of foods and medicine in a way peculiar to themselves.

In the concluding chapter the authors stated:

Whatever may be said of the Soviet economic system, it has at last brought to birth the science of preventive medicine. Pathologists have in late years been veering slowly to the opinion that, in combating disease, one must pay at least as much attention to the soil, the human body as to the micro-organisms that may invade it. To contemplate delicate and continuous adjustment between the body and its environment of sunlight, air, moisture, warmth and food. Individual health is an attribute not of man but to the whole community and of that community in relation to nature. Positive health can only be assured in a community where every other and where all barriers have been demolished that might inhibit the flow of air and sunlight, food and water supplies.

This book gives an answer to the very interesting question "How can we marry agriculture and health?" It should be read by all health administrators and those who are interested in the problem of nutrition and malnutrition in their own countries. The book is an interesting contribution to the study of the relation between the food and health of the people, which is the dominant problem in all countries today.—I. C.

Your Aquarium; A Guide to Cold Fresh-Water Aquarium-keeping. By J. A. Crabbe. London, The Bazaar, Exchange & Mart, Ltd., n. d. 66 pp. Price, 1s/6d.

In this booklet the author has aptly put together very practical directions and discussions on making and keeping an aquarium. He has grouped his explanations into six well-defined chapters under each of which are well-planned and well-arranged interesting topics.

The book begins with the correct choice of the suitable shape and size of the aquarium under different conditions, and where and how to keep the tank for absolute cleanliness and freshness in order to give the fish the most wholesome surroundings. This is followed by an elementary description of various aquarium fishes, especially the different varieties of goldfish. Mention is made of the fishes that can be reared together and those that are traditional enemies. The third

and fourth chapters treat of beneficial and harmful water-creatures as well as the different water plants and their adaptability and culture in the aquarium. The last chapter deals exclusively with the care of the goldfish throughout its life. The booklet closes with a very good list of references on aquarium keeping and aquatics plants.

The booklet is brief but complete for practical purposes. The directions, explanations, and descriptions are written in simple language. To the amateur aquarists and to those who are fond of observing living things this booklet should prove very useful.—Q. A. E.

Southern Forestry. By Charles N. Elliott and M. D. Mobley. Atlanta, Georgia, Turner E. Smith & Company, 1938. 494 pp., front., illus. Price, \$1.60.

The book is intended primarily for the people in the southern United States, where about forty-seven per cent of the total forest area of the country is located. The authors point out the important rôle forestry plays in the economic and social life of the Southerners. But while the book deals mostly with the forest conditions of the region and its various problems, the treatment is so broad and so well presented that the book will be found useful in general forestry anywhere. The authors are well-known pioneers in forestry and popular forestry education, having more than a decade of experience in scientific and practical forestry. This accounts for the appealing and interesting discussions which can easily be followed by the layman. The authors believe that forestry should have a place not only in the curricula of higher educational institutions but also in the curriculum of every school system, both rural and urban.

The book contains twenty-four chapters dealing with all phases of forestry. It is adequately illustrated with pictures and reinforced with valuable data and charts. A novel feature of the book is the list of suggestions and references given at the end of each chapter, designed to simplify the solution of various forestry problems. The authors discuss useful and illuminating questions in each chapter, including the simplest and most intricate problems, and cite the most modern and practical methods of approach for the successful practice of forestry. The book will be highly appreciated by those who are especially interested in forest management, forest products, and reforestation work. With the context so rich in informa-

tion on forestry, the book is valuable to all who live in the forest sections of the country. It is an excellent reference for those who are interested in the practice of forestry as well as for teachers in vocational education, particularly in agriculture.—E. F. R.

International Bibliography of Agricultural Economics, Vol. 1, No. 1. By the International Institute of Agriculture, Rome. October, 1938. 137 pp. Published quarterly. Price, \$1.60 per annum.

This bibliography is a continuation of "Berichte über Landwirtschaft" until recently published by Paul Parey, of Berlin. It indexes in a very general way all publications "dealing on the economic and social aspects of agriculture in the widest sense of the words," that are received from all countries by the Institute. The staff members of the Institute's library, who are in charge of the compilation, follow a special scheme devised by the Institute and printed in outline form after the introduction.

The citations listed in this first issue of the series are grouped under fourteen inclusive subjects. The subheadings do not follow any definite arrangement, although the references are grouped under each country, as far as possible, and listed alphabetically by author. The items are serially numbered.

The compilers announce in the introduction the inclusion at the end of each volume of an author index, which undoubtedly will facilitate its use. To enhance further the usefulness of this bibliography, a good subject index should also be appended.

—Q. A. E.

Index to the Literature on Spectrochemical Analysis 1920-1937. By William F. Meggers and Bourdon F. Scribner. Philadelphia, American Society for Testing Materials, 1939. 59 pp. Price, \$1.

This publication is the first attempt at putting together the widely scattered literature on spectrochemical analysis. Unlike two of its more important forerunners, "Bibliography of literature on spectrum analysis," compiled in 1935 by D. M. Smith, which included 195 papers on metallurgy, and "Spectrochemical abstracts, 1933-1937," with its 228 papers, compiled by F. Twyman, this index is general and comprehensive in scope, listing over 900 references published from 1920 to 1937, inclusive.

The introductory part gives a brief but inclusive account of the development of the science of spectroscopy as applied to chemistry. The index proper is divided into two sections;

namely, literature citations and detailed index. The citations, which are given in English except for a few books in foreign languages, are in chronological order. The items under each year are arranged alphabetically by the author. Each reference has a serial number which serves to identify it and guide the user to the corresponding entry in the citations.

To those engaged in spectrochemical research and related work this pamphlet is very important, if not indispensable.

—Q. A. E.

Cause and Prevention of Disease. By William Harvey Perkins. Philadelphia, Lea & Febiger, 1938. 713 pp. Price, \$7.50.

The main object of this book is to give the reader a systematic survey of the principal causes and origins of the disease and to acquaint him with all the essential facts about the mode of transmission and prevention. The materials used in this investigation consist of clinical data gathered from authoritative sources and discussed thoroughly in a detailed outline form.

The first chapter deals primarily with a new system of classifying diseases into six general groups, based upon the principal etiologic factors. Every group gives a brief description of the clinical aspect of the disease in relation to health. The method of classifying is simple and accurate and gives the reader an opportunity to have a clear understanding of the subject.

The important features of this book include a description of the relation of heredity to health, and the mechanisms involved by which the inheritance factor can be transmitted to the individual and the diseases that accompany it. It also offers a comprehensive study of the nutrition of men in health and disease, including an analysis of the chemical and physiological properties of the different food elements, and the metabolic changes that take place within the human body. It shows the need of protective measures against all nutritive defects. Another feature of this book is that part which deals with various processes of poisoning and intoxication. The toxic properties of the different poisonous substances, their pathologic effect upon the human body, and the prophylactic measures for prevention are well presented. The book also presents a brief serologic study of the human body and a bacteriological survey of the different pathogenic bacteria, fungi, and parasites. It describes the rôle which these microorganisms play in the epidemiology of infectious

diseases. The last chapter deals with a comprehensive study of the influence of the psychic factors on the physiologic activities of the human body. It discusses the etiology of various types of nervous and mental disorders and their effect upon the intellectual faculties of man.

The book is a good guide not only to the medical man but also to those who are interested in acquiring adequate knowledge on preventive medicine.—P. J. A.

Resisting Drought. By Reenen J. Van Reenen. Pretoria, The Government printer, 1935. 221 pp., frontis., illus.

This handbook is a rewritten form of the Report of the Drought Investigation Commission, Union of South Africa. It gives a discussion of the conditions obtaining in the Union. Although a few chapters are not applicable to the Philippines, the underlying principles are food for thought for every Philippine agriculturist and farmer.

The chapters, twenty-one of them, are concise, but seem to include all the vital information on each topic discussed. For example, Chapter I consists of a few short paragraphs. The author gives a general but picturesque view of drought, its immediate and remote causes, and its effects which extend even to the clergyman who at first may be thought beyond its influence. He defines water chemically and discusses the rôle it plays in all forms of life.

The author discusses farm practices in the Union of South Africa that tend to destroy the vegetation which is helpful in the conservation of the soil. Then he advances measures to remedy the devastating effects of such practices. Soil erosion and its causes and prevention are briefly discussed.

The means and methods of taking advantage of the infrequent and uncertain rains, the preservation of feeds in silos, construction of railways, cold storage of stock products, economic grazing, and catching of the run-off by constructing reservoirs are some of the essential factors recommended for successful farming.

The value of this book is increased by the inclusion, in the form of appendices, of the circulars on the problem encountered by the Drought Commission, the summary of the original report, and other basic information. It is a useful guide for farmers, especially in places where the water supply is a problem. It is illustrated. Realizing the value of the information the handbook gives, the author painstakingly made the text understandable even to the layman.—H. S. S.

Floral Morphology. A New Outlook with Special Reference to the Interpretation of the Gynæceum. By E. R. Saunders. Volume 2. Cambridge, W. Heffer & sons, Ltd., 1939. 609 pp., illus. Index to vol. 1. Price, 10s/6d net.

In genesis and scope this volume is similar to the first volume, published in April, 1937. The author believes that the formation of whorls of midrib bundles and their correspondence with the whorls of floral members is a fundamental feature of floral construction, and the fact that these midrib bundles originate from definite radii provides a means of determining the number in a whorl. Whether or not, or at what level these bundles branch, has no significance in regard to the number of the members in a whorl. Only their morphological form is thereby revealed. On this principle families are grouped, irrespective of their systematic position, though so far as was compatible with the author's plan, those more closely related were grouped together in the sections. The types were carefully selected, so as to vividly illustrate his principles, and at the same time likely to be in general more or less easily secured. This volume as a whole is illuminating and brings forth a new and fresh avenue for the proper approach to the grouping of our angiosperms, and may point to the possible solutions of our "puzzles" or "knots" in the family tree. The separate appendix, which gives an epitomized historical survey of the challenge made by numerous botanists between 1823 and 1923 to the traditional view of the structural nature of the gynæceum, certainly makes this volume the more indispensable to students of systematic botany.—J. B. J.

Malnutrition, the Medical Octopus. By John Preston Sutherland. Boston, Meador Publishing Company, 1937. 368 pp. Price, \$3.

This book was written, according to the author, to point out certain errors in human diet and nutrition, from prenatal days to advanced stages of human life. In it the author tries to emphasize the fact that a large percentage of human ills may be the result of a faulty and unbalanced diet. He also calls attention to the preventive possibilities of a natural and rational diet.

The book is divided into twenty-two chapters, the most interesting being the chapters entitled "The Prevention of Cancer; A Deficiency Disease and Malnutrition, the Medical Octopus." It is a departure from the usual presentation of

the subject as the author himself admits when he says in his preface: "In the following pages are set forth views which differ considerably from the commonly accepted ideas and practices concerning diet . . ."

Although many will disagree with the author in his views regarding the nutritive value of milk, his discussion about milk in Chapter III is worthwhile reading. The book should be read by all those who are interested in the subject of nutrition, on which it contains much valuable information. The medical practitioner should also read this book, especially the chapter dealing with malnutrition, where he can find many valuable pointers regarding nutrition.—I. C.

The Camper's Handbook. By Dillon Wallace. Illustrations by Edwin R. Cornwin. New York, Fleming H. Revell Company, 1936. 289 pp., illus. Price, \$2.

The book is a very handy guide for every camper, being clearly and simply worded and vividly and adequately illustrated. The book contains twenty-five chapters. In the first chapter the author gives a brief account of the history of camping in the United States. In the next eight chapters he defines and discusses various types of camping, and lists, describes, and illustrates the various materials and equipment which each type needs. The next four chapters deal with equipment for the individual camper. One chapter is devoted to a detailed discussion on the economical ways of provisioning the camp. Another eight chapters treat of efficient and economical camping stoves and pack bags, technique of building camp-fires and open-fire cooking places, methods and materials for home-made tents and how to waterproof them, fabrics and leathers, and methods of preparing game and fish for immediate or future use. In two more chapters the protection and treatment of the camper from bites or injuries inflicted by insects, serpents, poisonous plants, and other pests are fully discussed. The book closes with a discussion on the preparation of meals in the camp, including recipes adequate for the go-light cruiser and hunter. Although intended for the American camper, the author's treatment of the principles underlying successful camping is so thorough that the book should be very useful to any camper outside the United States. The book should also be very valuable to anyone who goes outdoors to get a feel of Nature.—S. A. M.

Modern Theories of Organic Chemistry. By H. B. Watson. Oxford, 1937. 218 pp. Price, \$4.50.

This book explains the application of electronic theory to the reactions of organic compounds.

The first chapter gives a brief review of the important theories of chemical combination from the time of Dalton and Lavoisier to J. J. Thomson, G. N. Lewis, and other recent contributors.

The second chapter gives an excellent account of the new physical methods of investigating organic compounds. These methods are X-ray, visible and infra-red spectra, and dipole moments.

In the following chapters the general reactions involving addition, substitution, tautomerism, molecular rearrangements, free radicals, and stereochemistry are explained in a very concise and simple manner in terms of the electronic theory.

The book is very interesting and instructive and, no doubt, will be greatly appreciated by those who are engaged in other lines and have not kept abreast in modern theories of organic chemistry.—A. P. W.

RECEIVED

BARGER, EDGAR HUGH, and LESLIE ELLSWORTH CARD. Diseases and parasites of poultry. 2d. ed. thoroughly revised. Philadelphia, Lea & Febiger, 1938. 386 pp., illus. Price, \$3.75.

BEAMISH, HULDINE. Your puppy and how to train him. New York, Lee Furman, inc., 1938. 206 pp., illus. Price, \$2.

ILLICK, JOSEPH S. An outline of general forestry. 3d. ed. rev. & enl. New York, Barnes & Noble, inc., 1939. 297 pp., illus. Price, paper, \$1; cloth, \$1.50.

KOURNAKOFF, SERGEI. School for riding. A primer of modern horsemanship. Boston, Hale, Cushman & Flint, inc., 1938. 180 pp., front., illus., appendix. Price, \$2.50.

SAUNDERS, E. R. Floral morphology. A new outlook with special reference to the interpretation of the gynæceum. Volume 2, with additional illustrations and index for volume 1. Cambridge, W. Heffer & Sons, Ltd., 1939. 609 pp. Price, 10s/6d.

SCHEFFEL, CARL, and ELEANOR MCGARVAH. Jurisprudence for nurses. Legal knowledge bearing upon acts and relationships involved in the practice of nursing. 2d. ed. New York, Lakeside publishing co., 1938. 248 pp. Price, \$3.

SQUIRE, MARIAN. The stag at ease, a cookbook being the culinary references of a number of distinguished male citizens of the world. Caldwell, Idaho, The Claxton printers, ltd., 1938. 164 pp. Price, \$2.

VERRILL, A. HYATT. Strange animals and their stories. Boston, L. C. Page & Company, 1939. 235 pp., front., illus. Price, \$2.50.

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